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COMMUNICATIONS & TECHNOLOGY

MARCH 2004

CQ

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"Project Goodwill Albania" Wrap-up

How to Work a Big DXpedition

Results: 2003 CQ WPX CW Contest

CQ Reviews: W4RT Antenna Boss

On the Cover: For Bob Wertz, NF7E, of Flagstaff, Arizona, DXing is fun, but the best part of ham radio is family togetherness. Details on page 60.

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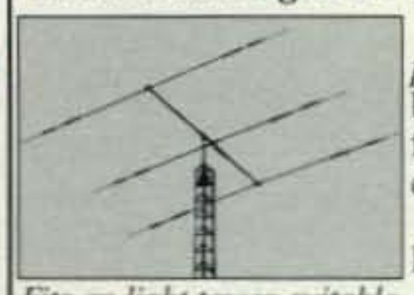
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TH-3MK4	**3**	**5.8**	**25**	**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$439.95**
TH-3JRS	3	5.8	25	600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$329.95
TH-2MK3	**2**	**3.4**	**15-20**	**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$339.95**
EXP-14	4	5.9	25	1500	10,15,20	7.5	100	14	31.5	17.25	45	1.9-2.5	HAM IV	$549.95

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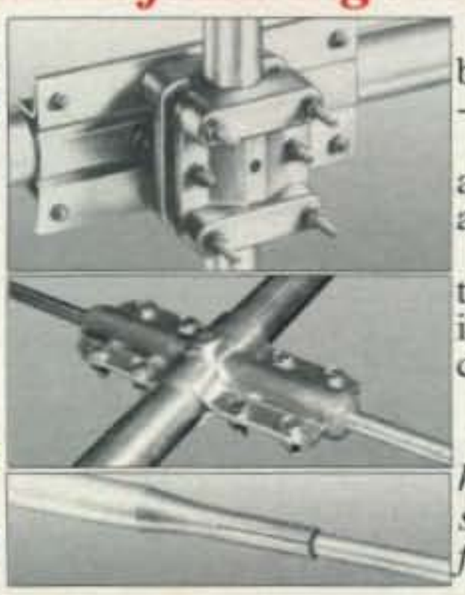

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ARRL Proposes New License Restructuring, Novice/Advanced Band Reallocations

The ARRL will file a comprehensive proposal with the FCC to create a new entry-level license with code-free HF access; to merge current Technicians, Techs with code credit and Generals into a code-free General Class; and to maintain the current 5 words-per-minute code requirement for Extra Class, into which current Advanced Class hams would be "grandfathered." The proposal will also call for reallocation of the current HF Novice and Advanced Class allocations and will include small increases in voice frequencies on 80 and 40 meters.

According to a news release posted on the ARRL website on January 19, the proposed "new Novice" license would allow the use of all types of currently permitted transmissions (CW, data, voice, and image) on limited portions of the 80, 40, 15, and 10 meter bands on HF, and would include VHF/UHF privileges on 6 meters, 2 meters, 222 MHz, and 440 MHz. Power would be limited to 100 watts on 80–15 meters and 50 watts on 10 meters and above, eliminating the necessity for RF safety questions on the proposed 25-question written exam. Specific HF frequency privileges would be: 3550–3700 kHz (CW/data) and 3900–4000 kHz (phone/image) on 80 meters; 7050–7125 kHz (CW/data) and 7200–7300 kHz (phone/image) on 40; 21,050–21,200 kHz (CW/data) and 21,350–21,450 kHz (phone/image) on 15; and 28,050–28,300 kHz (CW/data) and the current 28,300–28,500 kHz (phone/image) on 10 meters. There would be no privileges on 160, 60, 30, 20, 17, or 12 meters.

Generals, including "grandfathered" Technicians (with and without code credit), would get an additional 125 kHz of HF phone space under the ARRL plan, with privileges as follow: 80 meters—3525–3725 CW/data, 3800–4000 phone/image; 40 meters—7025–7125 CW/data, 7175–7300 phone/image; 15 meters—21,025–21,200 CW/data, 21,275–21,450 phone/image. There would be no change in General privileges on 20 meters or on the other HF bands (which do not have license-class subbands).

Extras (including current Advanced Class hams) would gain 25 kHz at the bottom of the 80-meter and 40-meter phone bands, which would start at 3725 and 7125 kHz, respectively, under the ARRL plan.

ARRL Chief Executive Officer Dave Sumner, K1ZZ, said the League is "trying to recapture the magic of the old Novice license, but in a manner appropriate for the 21st century." At press time, no petition had yet been filed with the FCC.

BPL Updates

The battle continues to protect amateur frequencies from possibly devastating interference as a result of widespread implementation of "Broadband over Power Lines," or BPL. "Washington Readout" Editor Fred Maia, W5YI, looks at the issue in depth in his column this month (page 82), but here are a few updates that have come in since Fred submitted his column:

• Congressman Greg Walden, WB7OCE (one of two licensed hams in Congress), has warned the FCC not to be too hasty in approving higher emission limits for BPL. In a letter to FCC Chairman Michael Powell, the Oregon Republican said the interference potential made the issue "of great concern" to him and, according to the *ARRL Letter,* said the FCC should wait for the National Telecommunications and Information Administration (NTIA), its counterpart for federal government spectrum usage, to complete a BPL study it is conducting and for the public to comment on the study results.

• FCC Chairman Powell, meanwhile, finally admitted publicly that BPL does have the potential to cause interference problems. The *ARRL Letter* says Powell told the National Press Club the FCC "will continue to explore ways to support this technology while protecting services from interference." And the NTIA's Assistant Secretary for Communications and Information told the BPL trade association that the risk of interference should encourage BPL operators to "design and operate their systems to avoid such interference."

• Hams in North Carolina, including *CQ VHF* Contributing Editor Gary Pearce, KN4AQ, conducted BPL interference tests in conjunction with a local utility, Progress Energy. Pearce reports that the signals could be heard more than a mile away by moderately equipped home stations, and that reverse interference tests (will data still flow when hams transmit?) were inconclusive. He noted that the tests only dealt with local signals, and that no consideration was given to possible skywave interference, since it's known that low-power ham signals on the same frequencies (10 meters) can travel thousands of miles under the right conditions. Pearce says the utility and the manufacturer (Amperion) were both concerned with possible interference to hams and other spectrum users and cooperated fully in the tests.

• In Austria, government officials shut down a BPL test project because it reportedly caused massive interference to emergency services during a disaster drill last year. According to the *ARRL Letter,* Radio Austria reported that the shutdown "not only means the end of the ... pilot project, but the end of the deployment of this technology in Austria..."

• Some alternatives are cropping up to the BPL systems that use the HF and low VHF sections of the spectrum. Panasonic has announced a system it says is capable of transmitting high-definition TV via BPL. It also says the system, which combines orthogonal frequency division multiplexing (OFDM) and Wavelet technology, is highly resistant to interference *from* outside signals, without the need for notch filters. The Panasonic release says nothing about interference *to* outside signals. And "TV Technology.com" reports that a company called Corridor Systems has successfully demonstrated a BPL system that operates in the microwave spectrum, between 2 and 20 GHz, leaving the HF spectrum untouched. Corridor Systems' Chief Engineer is a ham, N6GN. *(Tnx WA6ITF)*

Hams Get High Marks in "Topoff 2" Report

The final report on the Department of Homeland Security's national disaster drill last spring ("Topoff 2") credited ham radio with being the only way one Chicago hospital was able to maintain communications when its phone system got overloaded. For more on this exercise, see this month's "Public Service" column on page 62.

Correction

In last month's news item on the new Morse code character for "@", which will be an "A" and a "C" run together, we accidentally ran together the "dahs" at the end of the "A" and beginning of the "C." The correct symbol will be ".--.-." sent as a single character.

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T-2X, $649.95. *Extra heavy duty Tailtwister antenna rotator!* For large antennas up to 20 square feet wind load when mounted in-tower, or 10 square feet when mast mounted with optional support bracket. Triple 138 ball bearing race, strong electric locking steel wedge brake. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches. Accepts masts up to 2 1/16 inches diameter. Rotator size is 14 1/16Hx9 3/16D in.

CD-45II, $389.95. *Medium duty antenna rotator.* Handles antenna arrays up to 8.5 square feet windload area when mounted in-tower, or 5 square feet when mast mounted with supplied lower support. Dual 48 ball bearing race, disc brake system. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches with disc brake release. Accepts mast sizes up to 2 1/8 diameter. Includes light duty lower mast support, Rotator size is 17 3/8Hx8 D inches.

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Rotator Specifications	T2X	HAM-IV	CD-45II	AR-40
Wind Load capacity (inside tower)	20 sq. ft.	15 sq. ft.	8.5 sq. ft.	3.0 sq. ft.
Wind Load (with mast adapter)	10 sq. ft.	7.5 sq. ft.	5.0 sq. ft.	1.5 sq. ft.
Turning Power (in pounds)	1000	800	600	350
Brake Power (in pounds)	9000	5000	800	450
Brake Construction	Electric wedge	Electric wedge	Disc brake	Disc brake
Bearing Assembly/How many	Tripl race/138	Dual Race/96	Dual race/48	Dual race/12
Mounting Hardware	Clamp plate	Clamp plate	Clamp plate	Clamp plate
Control Cable Conductors	8	8	8	5
Shipping Weight (pounds)	28	24	22	14
Effective Moment (in tower)	3400 ft/lbs.	2800 ft/lbs.	1200 ft/lbs.	300 ft/lbs.

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BY RICH MOSESON, W2VU

Bringing It All Together

Last year, when my home town announced it was starting a Community Emergency Response Team (CERT), I started making some inquiries about the possibility of including amateur radio in the program. A series of phone messages and e-mails resulted in an invitation to attend the town's Local Emergency Planning Council (LEPC) meeting in January, plus a meeting beforehand with the coordinator and deputy coordinator of the town's Office of Emergency Management (OEM), to explain how ham radio could help the town in an emergency. The LEPC brings together representatives of all of the town's emergency services, plus county officials, school and business representatives and the CERT coordinator.

What I saw and heard reinforced the messages I've been seeing and hearing at such places as the 9-11 Commission hearing I wrote about last month and our own public service column here in *CQ*. In the aftermath of 9-11, there is a huge (and decades-belated) push by the federal government to get everyone who may need to deal with a large-scale emergency talking to each other, speaking the same language (literally and figuratively) and using the same procedures. When I learned the basics of amateur radio emergency communications some 30 years ago, everybody did their own thing. Even within amateur radio, the ARRL had its forms and procedures (sometimes different ones for the National Traffic System and the Amateur Radio Emergency Service); RACES—the Radio Amateur Civil Emergency Service—had its forms and procedures (sometimes varying from place to place if the sponsoring Offices of Emergency Management had variations); MARS—the Military Affiliate Radio Service—had still different ones, and the agencies we serve, such as the Red Cross and Salvation Army, each had their own way of doing things. Learning to adapt usually wasn't difficult, but it slowed things down. That learning process tended to take place when things were just getting started—and thus when the need was greatest, people were stumbling over forms and procedures.

Beyond the "borders" of amateur radio, the differences were even more pronounced. When multiple agencies needed to respond to a large-scale emergency or disaster, they were limited not only by lack of interoperability in their radio systems (a gap hams have long helped to bridge), but also a lack of uniformity in command structure, procedures and paperwork.

From 1970 to 9-11

That all began to change some 30 years ago, after wildfires in California in 1970 burned 600,000 acres and took 19 lives. The extent of the death and destruction was blamed at least partially on lack of coordination and communication among the many agencies that responded to the fires. A meeting of key agencies afterward resulted in a plan that has grown into today's Incident Command System, or ICS (see November 2003, *CQ*, Public Service column for more details). ICS was slow to be accepted outside of California, but the response to the attacks of September 11, 2001 showed that huge problems continued to exist in terms of unified command and control at the scene of a major disaster. Emergency management officials began to realize that they needed to have a structure in place for working effectively and efficiently with multiple agencies, without wasting valuable time in setting up ground rules and procedures for each new event. They found that the model they were looking for already existed in the 30-year-old Incident Command System, and with federal encouragement, began adopting ICS nationwide. Now, the thrust is to provide at least a basic level of ICS training to virtually anyone who might be involved in any sort of emergency response, from the obvious police officers and firefighters to school officials and corporate safety officers and, of course, hams. My home county has received a federal grant to provide ICS training to as many interested people as possible, and is scheduling a wide variety of courses to make the training as convenient as possible.

One of the major themes that *was* discussed at the 9-11 Commission hearing I attended last year (see last month's "Zero Bias" for what *wasn't* discussed) was the need for greater communication and cooperation between public safety agencies and private companies. One thing that became obvious on 9-11 was that companies in the World Trade Center that had emergency plans in place and put them into practice fared better in the aftermath of the attacks than those that did not. Future emergency preparedness efforts, it was clear, would need to bring together everyone—public, private, state, local, and federal—who might be involved in emergency response and try to get everyone familiar with a unified set of procedures.

The inclusion of business representatives on Local Emergency Planning Councils and the effort to provide ICS training to schools and businesses and individuals such as hams, as well as professional emergency responders, is part of that new realization that our collective safety and security depends on cooperation and clear channels of communication and command. As my local OEM Director put it, "the importance of everyone being on the same page is paramount."

Chances are that ICS training is available wherever you live. If not, an online introductory course is available through the Federal Emergency Management Agency website at <http://training.fema.gov/EMIWeb/IS/is195.asp>. We strongly recommend that you take the basic ICS course so that you are, at a minimum, familiar with the vocabulary, command structure and procedures should you ever be called on to help in an ICS-based emergency response. As communicators, we need to be able to jump into just about anything and hit the ground running. I also recommend CERT training if your community offers it.

ARRL Emergency Communications Courses

The ARRL is now in the second year of its federal grant reimbursing the costs of providing its own level one emergency communications course. One of the requirements of this second year's funding is to "bring it all together," and include as many ARES, RACES, and other amateur-related groups as possible under the training umbrella. The goal is the same—provide uniform training to as many people as possible so that there is as little confusion as possible in responding to any emergency, large-scale or local. And yes, the ARRL course includes a basic introduction to ICS.

What you may have learned 20 or 30 years ago about responding to a communications emergency is no longer enough. We all need to "be on the same page" not only with each other but with the agencies we serve and work together with as well.

ARRL's Re-Restructuring Proposal

The ARRL's proposal to take the next step in amateur radio license restructuring came out just as we were going to press with this issue (see "Ham Radio News" for details). At first glance, and judging only by the information in the League's announcement, it looks like a pretty good proposal that should garner support from a majority of hams. We hope to have more details for you next month, and we'll reserve final judgment on the plan until we see the actual proposal being submitted to the FCC.

73, Rich, W2VU

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Clockwise from left: Jack Burchfield (seated), K4JU, President; Gary Barbour, AC4DL, VP/Engineering Director; Scott Robbins, W4PA, Sales & Marketing Manager; Larry Worth, WA4BSM, Production Manager; Paul Clinton, WD4EBR, Service Manager

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announcements

Wisconsin QSO Party – Sponsored by the West Allis RAC, Phone/CW, 1800Z March 14 to 0100Z March 15. Frequencies (MHz): CW 3.550, 3.705, 7.050, 14.050, 14.050, and 15m, 10m, 6m, 2m and up. Phone 3.890, 7.230, 14.290, 21.350, 28.400, 6m, 2m, and up. No repeaters. Categories: Single Op, Multi-Single, Multi-Multi, and Mobile. Mobile ops may not sit on a county line to operate. Exchange: SPC or WI county. QSO points: Phone 1 point, CW 2 points. Score: PWR mult × QSO pts × WI counties (max. 71); WI stations—QSO pts × WI counties + SPC; WI mobiles/portables add 500 bonus points for county with 12 or more QSOs. Power multiplier: ×2 (<5 watts), ×1.5 (<150 watts), ×1 (>150 watts). Information on electronic log format and/or other information, go to <www.warac.org>. Logs are due no later than April 14 and go to <k9kr@powercom.net> or to Wisconsin QSO Party, West Allis RAC, P.O. Box 1072, Mllwaukee, WI 53201.

W4BKM Special Event Station – The Macon ARC will operate W4BKM from 1500–2200Z on March 20 at the 22nd annual Cherry Blossom Festival in Macon, Georgia. Phone 14.240 and 21.335; CW 7.055, 14.055, and 18.075. For certificate send QSL and 9 × 12 SASE to Macon ARC, P.O. Box 4862, Macon, GA 31208.

W4UG (Virginia Beach, VA) & LA5M (Moss, Norway) – The Virginia Beach ARC and Mossegruppen av NRRL will be on the air from 1300Z March 20 to 2200Z March 21 to celebrate the 113th anniversary of the Norwegian Lady. Frequencies: 14.278, 14.040, 7.280 MHz. For certificate send 9 × 12 SASE to VBARC, P.O. Box 62003, Virginia Beach, VA 23462.

• **The following hamfests, etc., are scheduled for March:**

Mar. 6, **23rd Annual Mike & Key ARC Electronics Show & Fleamarket**, Pavilion Exhibition Hall, Western Washington Fairgrounds, Puyallup, WA. For information call 253-631-3756 (6 AM to 9 PM PST) or e-mail: <mwdink@eskimo.com>. (Talk-in 146.82/22 [PL 103.5]; exams info 206-824-9039, e-mail: <k7yh-jan@comcast.net>)

Mar. 12–14, **44th Annual Acadiana ARA Rayne Hamfest,** Rayne Civic Center, Rayne, LA. For details see: <www.w5ddl.org/hamfest>. (Exams)

Mar. 13, **North Arkansas ARS Hamfest**, North Arkansas District Fairground, Harrison, AR. Contact Bill Rose, N5VKF, e-mail: <billrose@cox-internet.com>; <http://naars.org>. (Talk-in 147.000, –600 input, no PL; exams)

Mar. 13, **51st Annual Kennehoochee ARC Hamfest, Cobb** County, Jim Miller Park, Marietta, GA. Contact Bob Butler, W4RBB, 770-579-9420, e-mail: <w4rbb@arrl.net>; <http://www.w4bti.org>. (Talk-in 146.880 [–] PL 100; exams 9 AM [bring copy of license]; also no-code Tech license training and testing session from 8:30 AM to 5 PM with test at 4:30, $40 fee)

Mar. 13, **Scottsdale ARC Hamfest**, Scottsdale Community College, Scottsdale, AZ. Contact Ed Nickerson, WU7S, 480-949-5162, e-mail: <enickerson2004@aol.com>. (Talk-in 147.18, PL 162.2; exams)

Mar. 14, **Orange County ARC Hamfest**, Temple Hill School, New Windsor, NY. Contact Ed Moskowitz, N2XJI, 845-534-3492, e-mail: <n2xji@arrl.net>. (Talk-in 146.760 [100 Hz]; exams)

Mar. 14, **Two Rivers ARC Hamfest/Computer Fair**, Spectrum in Boston, Boston, PA. Contact Two Rivers ARC, P.O. Box 225, Greenock, PA 15047; e-mail: <w3oc@arrl.net>.

Mar. 20, **Brenham, Texas Hamfest**, Fairgrounds, Brenham, TX. Contact Dan, N5UNU.

Mar. 20, **HAM-EX 2004 Hamfest**, Brampton Fall Fairgrounds, Brampton, Ontario, Canada. Contact Peter Taylor, VE3DRS, 365 Vodden St. E., Barmpton, ON L6V 1N5 Canada; e-mail: <ham-ex@sympatico.ca>; <http://www.peelarc.org>.

Mar. 20–21, **Midland ARC St. Patrick's Day Hamfest**, Midland County Exhibit Building, Midland, TX. Contact Joe, KK5ZG, e-mail: <kk5zg@caprok.net>; <www.w5qgg.org>. (Talk-in 147.300)

Mar. 21, **Tri-County ARC Hamfest**, Jefferson County Fairgrounds Activity Center, Jefferson, WI. Contact TCARC, 213 Frederick St., Fort Atkinson, WI 53538 (920-563-6381 evenings: e-mail: <jsatt@ticon.net>; <www.cmdline.com/tcarc/>). (Talk-in 145.49; exams 9 AM)

Mar. 21, **TMRA Hamfest/Computer Fair**, Lucas County Recreation Center, Maumee, OH. Contact Toledo Mobile Radio Assn., P.O. Box 9673, Toledo, OH 43697-9673 (phone 419-535-6594); <www.tmrahamradio.org>.

Mar. 28, **Lake County ARA Hamfest/Computerfest**, Madison High School, Madison, OH. Info e-mail: <rocky@lcara.org>; <http://www.lcara.org>. (Exams)

Mar. 28, **CVRC Spring Hamfest**, Henniker Community School, Henniker, NH. Contact Jim McElroy, NS1E, 603-428-7436; e-mail: <ns1e@arrl.net>. (Talk-in 146.895 [–600, PL 100 Hz]; exams 9:30 AM, register 9 AM, for info or to preregister contact Al Bardwell, NS1O, 603-228-1407, e-mail: <ns1o@arrl.net>.

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A publication of

CQ Communications, Inc.
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Offices: 25 Newbridge Rd., Hicksville, NY 11801, Telephone 516-681-2922; Fax 516-681-2926. E-mail: cq@cq-amateur-radio.com. Web site: www.cq-amateur-radio.com. CQ (ISSN 007-893X) is published monthly by CQ Communications, Inc. Periodical postage paid at Hicksville, NY 11801 and additional offices. Subscription prices (all in U.S. dollars): Domestic-one year $31.95, two years $57.95, three years $83.95; Canada/Mexico-one year $44.95, two years $83.95, three years $122.95; Foreign Air Post-one year $56.95, two years $107.95, three years $158.95. U.S. Government Agencies: Subscriptions to CQ are available to agencies of the United States government including military services, only on a cash with order basis. Requests for quotations, bids, contracts, etc., will be refused and will not be returned or processed. Entire contents copyrighted by CQ Communications, Inc. 2004. CQ does not assume responsibility for unsolicited manuscripts. Allow six weeks for change of address.

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In a follow-up to OH2BH's article in last November's issue, K7WX and K9LA offer their perspective on this unique international project to expand the number of hams in Albania and to make amateur radio part of the technical school curriculum there.

No, it's not an exotic South Pacific island, but who can pass up a pretty picture of putting up a low-band vertical at sunset in Durrës with the Adriatic as a backdrop?

Project Goodwill Albania 2003

An Amateur Radio Success Story

BY WARREN HILL,* K7WX, AND CARL LUETZELSCHWAB,† K9LA

After a long absence, Albania returned to the amateur radio bands in 1991 when an international group of volunteers put ZA1A on the air and began to train a local amateur population. Twelve years later, Martti Laine, OH2BH, who had led the 1991 effort, spearheaded Project Goodwill Albania 2003, which put an amateur radio license course into the curriculum of a technical university, attracted 37 university-level students to amateur radio, licensed 39 new ZA hams, and brought Albania into CEPT (more on that later). Again, this was an international program, with hams from more than a half-dozen countries playing various roles.

This unique project was carried out in cooperation with the Ministry of Telecommunications and the Faculty of Electrical Engineering of the Polytechnic University of Tirana. For background information leading up to this project, please read Martti Laine's article, "Project Goodwill Albania 2003" in the November 2003 issue of *CQ*. This is the story of the educational aspect of the five-week project.

Course Leader John Share, G3OKA, and Polytechnic University Lecturer Sonila Agago, now ZA1YL, sitting on the desk in the classroom, with Geni, ZA1B (back), and Angel, EA1QF (front), sitting next to the desk. John was Lead Teacher for the first three weeks of the five-week program. (Photos courtesy of the authors)

Live TV Coverage

The project was formally initiated on Sunday, November 9, by Spartak Poci, the Minister of Transport and Telecommunications, during an opening ceremony that was broadcast on Albanian television. The five-week course began the following day and exposed an eager group of electronics engineering students to four hours of teaching five days a week. The syllabus for each week (see Table I) was developed from the Radio Society of Great Britain's *Radio Amateurs' Examination Manual*.

All teaching was under the capable supervision of Course Director John Share, G3OKA. John is a professor at the University of Liverpool, and he was Lead Teacher for the first three weeks.

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Week	Lead Teacher	Dates	Subject(s)
1	G3OKA	November 10–14	Electronics
2	G3OKA	November 17–21	Propagation, Antennas, and Transmitter Interference
3	G3OKA	November 24–28	Receivers, Transmitters, and Transceivers
4	DJ2YA	December 1–5	Regulations, Operating, and Electromagnetic Compatibility
5	DJ2YA	December 8–12	Measurements

Table I– Course syllabus.

The second week of the project was run by the U.S./ARRL team, featured here with John, G3OKA (standing on the left). Standing in front of and to the right of John is Vicky, AE9YL, then Warren, K7WX, in back, and Carl, K9LA, on the right.

Uli Weiss, DJ2YA, a retired school teacher, was Lead Teacher for the last two weeks. Throughout the project, they worked closely with Sonila Agago, a lecturer in the Department of Electronics at the Polytechnic University.

All of the students were in the fourth or fifth year of an electronics engineering degree program. Their ages ranged from 17 to 23, and about one third were women. With an already established foundation in electronics engineering, the subject matter for the amateur radio license did not pose any serious problems. When something was not clearly understood, it generally had more to do with the complexities of the English language than any technical issue involving electronics theory.

John did the bulk of the teaching for Week 1 (Electronics). He received support from DL6LAU, DL7AJA, EA1QF, G3LQP, I2KMG, OH2BH, UT7DW, and ZA1B.

Warren Hill, K7WX, was Team Leader for Week 2 (Propagation, Antennas, and Transmitter Interference), which was the United States week. The American team had two purposes: to begin assembling several stations at two hotels in Durrës (a coastal city about an hour west of Tirana) and to continue the teaching activities at the university.

The team responsible for station assembly in Durrës consisted of Dan Brown, NA7DB, and his wife Janet; Rich Chatelain, K7ZV, and his wife Barb; Paul Rubinfeld, WF5T; Robin Critchell, WA6CDR; and Don Wilson, K6RKE. These stations provided many DXers with a ZA QSO and were used in the CQ WW CW Contest for ZA1A in the multi-multi category.

The teaching team for Week 2 consisted of Warren Hill, K7WX, and Carl Luetzelschwab, K9LA, with John, G3OKA, monitoring to assure that the university standards were upheld. To bring some practicality into the antenna lesson, a 10-meter inverted-Vee was built in class, and scale models of a Yagi and a quad were used to explain the concepts of directional antennas and radiation patterns. The propagation lesson reviewed the influence of the Sun, ground-wave propagation, tropospheric propagation, the ionosphere, and sky-wave propagation. Included in the propagation topic was a detailed analysis of a very-long-distance low-band QSO in relation to refraction and absorption. The American team also gave an overview of CEPT (European Conference of Postal and Telecommunications Administration) and FCC licensing.

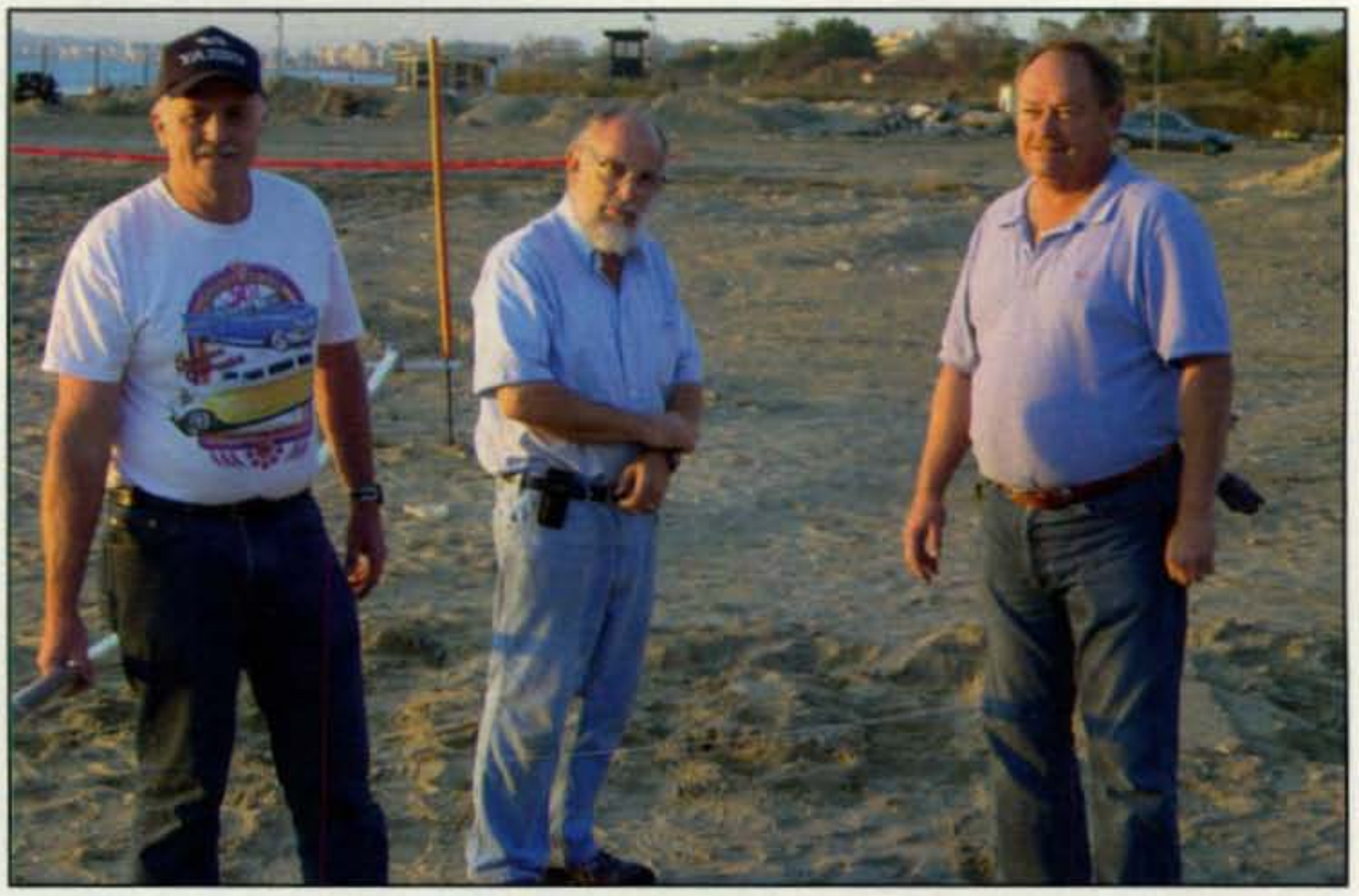
Week 2 ended with John, Warren, Martti, Carl, Vicky (AE9YL , Carl's wife), Dan, and Paul (the latter two coming in from Durrës) talking about the important role that amateur radio has played in their lives, personally and professionally.

John handled all the teaching chores for Week 3 (Receivers, Transmitters, and Transceivers). At the end of that week John conducted the theory por-

This team did the last two weeks of teaching. From left: Uli, DJ2YA; Sonila, ZA1YL; and Pertti, OH2PM.

Sonila, ZA1YL (YL)	Nardi, ZA1DF
Albi, ZA1BF (YL)	Bere, ZA1BR
Mira, ZA3DA (YL)	Ahmed, ZA1BD
Era, ZA1BU (YL)	Koco, ZA1DE
Blero, ZA2BB (YL)	Erion, ZA1BT
Jeta, ZA5BB (YL)	Diana, ZA1BP (YL)
Mandi, ZA1BK	Mirgen, ZA1DI
Lori, ZA1DG (YL)	Denis, ZA1BO
Miri, ZA2BD	Neri, ZA4BA
Anita, ZA2BA (YL)	Sead, ZA5BC
Spiro, ZA1DJ	Geni, ZA1BS
Ada, ZA2BF (YL)	Desar, ZA1BC
Genti, ZA1BW	Elda, ZA1BQ (YL)
Liri, ZA2BE	Erald, ZA1BV
Stela, ZA1DK (YL)	Klajd, ZA1DC
Landri, ZA1BH	Armand, ZA1BI
Zaiti, ZA1BC	Alma, ZA1DL (YL)
Buna, ZA1BN (YL)	Steve, ZA1DX
Erion, ZA5BA	Aldo, ZA1BY
Maro, ZA1DH	

Table II– New ZA licensees.



Rich, K7ZV; Robin WA6CDR; and Dan NA7DB, were among the American hams assigned to set up four stations at a hotel in Durrës, on the Adriatic coast. Here they are planning the low-band antenna layout at the beach.

tion of the CEPT A exam. With his three-week tour of duty completed, John headed back home to Liverpool after a job well done. Uli took over as Lead Teacher for Weeks 4 and 5, with help from Pertti Simovaara, OH2PM.

The highlight of Week 4 was a trip by the students on Tuesday to Durrës to get a good dose of practical antennas and amateur radio in action. Under the guidance of Robin and Don, the students examined the recently erected low-band vertical arrays and learned practical methods of installing, measuring, phasing, and feeding antennas. They learned about station equipment and accessories, including methods of signal monitoring to assure spectral quality. With four operating sites set up, the students also got lots of on-the-air time. In their course evaluations, many of the students made a point of mentioning that their time at the stations in Durrës was the high point of their experience.

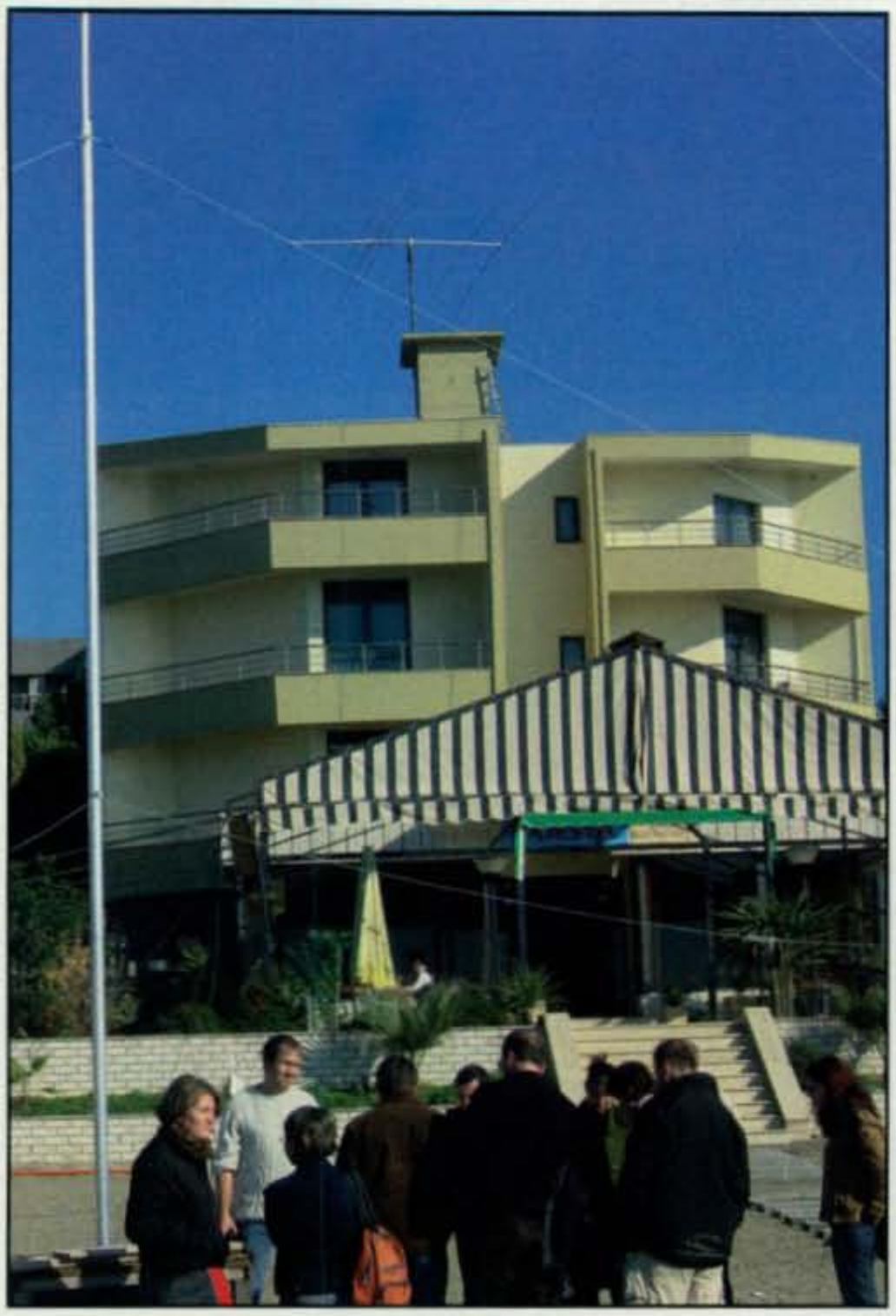
Week 5 (Measurements), capably taught by Uli and Pertti, completed the classroom instruction. Then under the watchful eye of the Albanian licensing authority ERT (Enti Regulatory I Telekomunikaciove), the students took the full CEPT A exam on Friday. Thirty-seven students, plus Sonila (we always figured she would take the exam) and Steve (an employee of the Norwegian company Telenor, which provides communications needs to the NATO base in Durrës), received their ZA amateur radio licenses. Of the 39 new amateurs, 14 are YLs, so working an Albanian YL is a very high probability in the future. See Table II, "New ZA Licensees," for the names and calls of these new amateurs.

With a total of 39 new hams licensed, a good question to ask is "Will all of these new operators be able to get on the air?"

One way for them to get on will be to use the station at the university. It is expected to be operational in the spring, with an FT1000MP Field and Quadra System. It has been assigned the call ZA1UT (for the University of Tirana).

Got a Spare Rig?

To help the newly licensed individuals get on from their homes, the Project Goodwill Albania 2003 team is soliciting donations of used transceivers. If



← *The students got hands-on experience with antennas and operating during their day in Durrës. Many cited this as the highlight of the course.*

From left, newly licensed Elda, ZA1BQ; Sonila, ZA1YL; and Diana, ZA1BP, getting some on-the-air time. Fourteen of the 39 newly licensed ZA hams are YLs, so don't be surprised to hear a female voice on your next Albanian contact. ↓

you have an older but functional rig (preferably solid state) sitting around gathering dust and you'd like it to be put to good use, please contact either of the authors of this article.

Another important result of this project was bringing Albania into the CEPT agreement. This is a cooperative European program which, among other things, allows amateurs licensed in any member country to operate in any other member country without special licensing requirements. The United States is a non-member participant in CEPT. Now Albanian hams may operate in most European countries (and in the U.S.) with minimal effort. Likewise, European and American hams may operate in Albania with minimal effort (all that's needed is your original license and a copy of a special announcement about the program).

Mutual Thanks

During the closing ceremonies the organizers of Project Goodwill Albania 2003 thanked the Albanian authorities and the university faculty for allowing amateur radio to be a part of the Faculty of Electrical Engineering curriculum. In a like manner, the Albanian authorities and university faculty thanked all the participants. To cap off this highly successful event, Martti, OH2BH, was honored by being designated a "Senior Fellow of Polytechnic University of Tirana."

We are pleased to have been able to help out with this ground-breaking project. All of the members of the American team very much enjoyed the opportunity to play a role in the development of amateur radio in the Republic of Albania.

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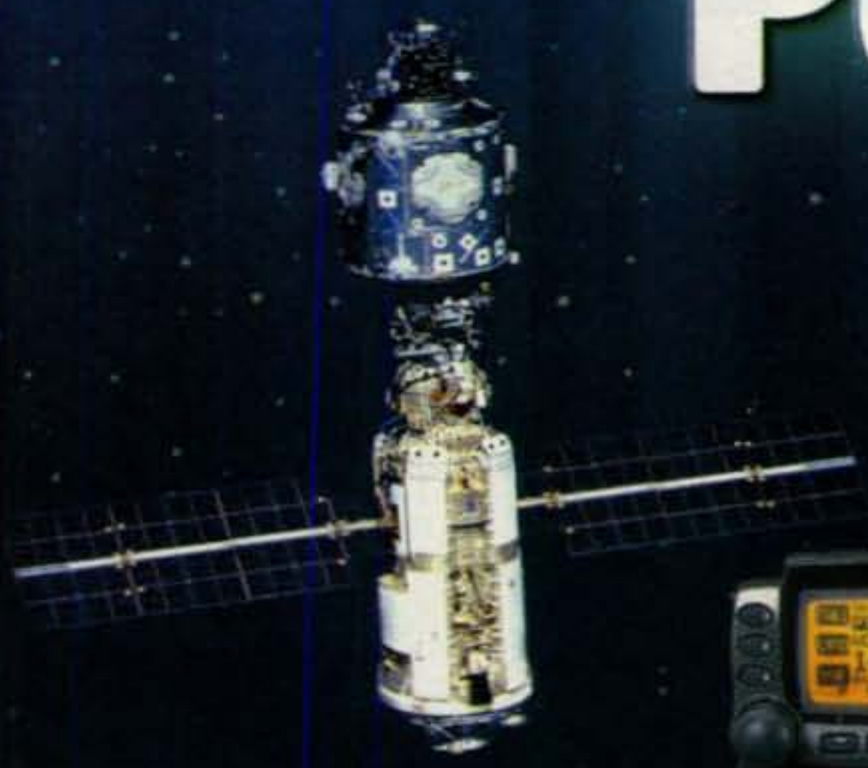

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How can a beginning or casual DXer break through the pile-ups to work a major DXpedition to "a rare one," some dot on the map that normally isn't heard on the ham bands? Here are some tips from folks who plan to be listening for your calls later this month.

Yes, You *Can* Work A Big DXpedition!

Tips on Contacting the 3B9C DXpedition to Rodrigues Island, March/April 2004

BY NEVILLE CHEADLE,* G3NUG, AND DON FIELD,† G3XTT

Note: We normally wait to report on DXpeditions until after they've happened, since Murphy sometimes disrupts the best-laid plans of mice and DXers. However, in this article focused on an operation scheduled to begin later this month, G3NUG and G3XTT have such excellent general advice on working DXpedition stations that we decided not to wait. —W2VU

By now many readers will be aware of Project Star Reach, the next project to be undertaken by the Five Star DX Association (FSDXA), which organized the 1999 9MØC and 2001 D68C DXpeditions. The latter, incidentally, is still the only DXpedition to have achieved over 100,000 QSOs, with its massive total of 168,000. The forthcoming expedition, to Rodrigues Island in the Indian Ocean (see fig. 1), will sign 3B9C and will be active from around March 19th to April 12th.

One of the successes of the D68C Comoros Island DXpedition was the way in which it brought some 3400 UK amateurs onto the HF bands to work the expedition. That's probably close to 10% of all the amateurs in the UK who were licensed for HF operation at that time. Many brushed off their old valve (tube) transceivers to work the expedition, and some clubs organized special club nights so that those who had limited stations at home could still have a shot at D68C. Many of these amateurs probably would not have bothered with other HF DXpeditions; there is often a feeling that DX chasing is only for those with huge antennas and kilowatts of power. However, the FSDXA team themselves had made a point of taking plenty of hardware, so the chasers stood a good chance, even with modest stations of their own. The 3B9C organizers feel that with the right encouragement, a similar level of participation can be reached in many more countries as well. Hence this article.

Since 2001 many more HF operators have come onto the bands through new license structures and, most recently, through the abolition of mandatory Morse testing in many countries, leading to former VHF-only licensees being granted HF privileges for the first time.

FSDXA selected Rodrigues Island in the Indian Ocean as a suitable location around which to base this project (so called because the expedition itself is just one part of it, albeit the central element). Rodrigues has just one resident amateur, 3B9FR, and has seen no DXpedition activity since 1999, almost half a sunspot cycle ago. It's accessible enough, though, to permit the shipping of the six tonnes of equipment (6 metric tonnes = 13,228 pounds) that the expedition will require and should have excellent propagation to the major centers of amateur radio population (Japan, Europe, and the USA). An advance team has already been out to Rodrigues to ensure that the necessary logistics are in place, and to establish relationships with key local contacts (including Robert, 3B9FR, the resident amateur mentioned above).

However, Project Star Reach is very much aimed at you, the reader. The organizers are keen to ensure that you are able to participate through making contact with 3B9C on a range of bands and modes and chase after one of the attractive trophies on offer. For seasoned DXers that means being able to fill in those 3B9 band slots that you might still be missing, but hopefully it will also mean that you try out a new band

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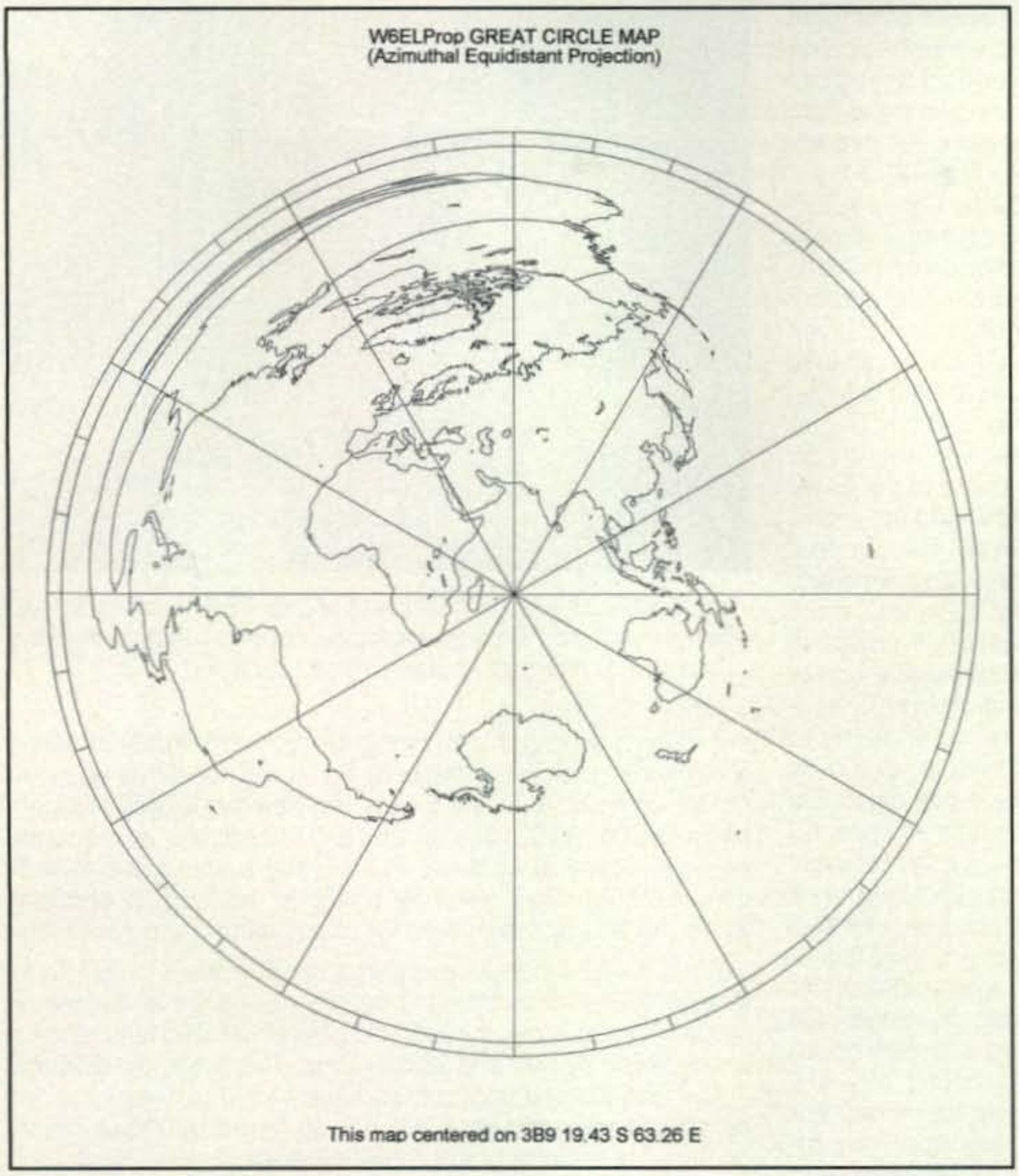

Fig. 1– Great circle map centered on Rodrigues Island in the Indian Ocean.

Band (MHz)	Dipole length (feet)	(meters)
7	66.0	20.1
10.1	46.3	14.1
14	33.0	10.0
18	25.8	7.86
21	22.0	6.70
24.9	18.8	5.73
28	16.5	5.00

Table I– Lengths of half-wave dipole antennas.

or mode, perhaps satellite or PSK. For those new to HF, while the team certainly can't guarantee you a contact on all nine bands, almost everyone should be able to manage at least a handful of QSOs. The main purpose of this short article is to give you some advice on how best to go about doing so.

Propagation and Choice of Band

One of the tough decisions DXpeditions have to make is when to operate on each band. Anyone who has operated from near the equator will know that only the highest bands are open during local daylight, but from dusk to dawn all nine HF bands can be open simultaneously. With anything less than nine stations available, some will have to be missed. The good news is that 3B9C will be able to operate all nine bands at once (Yaesu, the principal sponsor, is providing ten FT-1000MP MkV transceivers and ten VL-1000 Quadra amplifiers), and all being well, may even be able to activate more than one station on some bands (10, 15, 20, and 80) to be active on both CW and SSB together. As a result, if there is an opening from your area to 3B9 on a particular band, rest assured that 3B9C will be there for you.

That brings us to propagation, of course. Many DXpeditions nowadays run propagation forecasts for the major geographic areas and post them on the DXpedition website. 3B9C is no exception. However, if you live elsewhere in the world, or want to run some much more specific predictions for your own QTH, there are plenty of propagation prediction software packages available that allow you to do it yourself. Follow some of the links at the end of this article for some good examples. Rest assured that the 3B9C team members have done similar analyses themselves and will be aware of where their beams should be pointing on any given band and at any given time. Almost certainly, the easiest bands on which to look for your first QSOs with the expedition are going to be 20, 17, and 15 meters. As the sunspots start to reduce in number, openings on the highest bands become less frequent, while the low bands are always a tougher challenge, with greater absorption and higher noise levels.

Of course, most serious DXers have gain antennas for 20, 15, and 10 meters, often a triband Yagi or even stacked monobanders. Therefore, even on those bands you may well have to wait your turn for a QSO (the good news is that 3B9C will be active for three full weeks and four weekends). Far fewer DXers have gain antennas for 30, 17, and 12 meters, so 17 meters may well be an excellent band on which to focus to make that first 3B9C QSO (or, indeed, to chase other DXpeditions).

This highlights one of the dilemmas facing the would-be HF operator. With nine HF bands available, not to mention the VHF bands, how on earth can you put up an effective antenna system to cover them all? Unless you live on a farm, the answer is probably "no way." This is why low-profile multiband antennas such as trapped verticals or the G5RV are so popular, but inevitably they are compromise antennas. It's often forgotten, for example, that when Louis Varney, G5RV, came up with his ground-breaking antenna design, not only did the WARC bands not exist, neither did 15 meters. Also, in no way was the antenna expected to present a resistive 50-ohm load to the transmitter; in those days of valve PAs (tube-power amplifiers), though, it didn't really matter! Modern solid-state rigs may behave differently and reduce power in the face of what they see as a mismatch.

A Simple Alternative

In the *RadCom* article which preceded the D68C expedition, the team recommended instead to focus on one band

at a time and to install a resonant sloping dipole orientated towards D6. This led to a great deal of positive feedback after the expedition, with many operators discovering that such an arrangement worked much better on that specific band than their multiband systems, allowing them to work the expedition much more easily.

The recommendation is very much the same again. A full-size, resonant dipole cut according to the standard dimensions, out in the clear and ideally sloping and oriented towards 3B9C, is an excellent starting point for those of you without Yagis or other gain antennas. Suitable dimensions are given in Table I (you may need to modify them slightly to achieve best SWR, as lengths can be affected by surrounding objects, etc.). The antenna can be suspended from a chimney or gutter, perhaps. Feed with 50- or 75-ohm coax, with the center conductor going to the higher half and the shield to the lower half. Seal the feedpoint to keep out moisture, add insulators at either end, and you have an excellent single-band antenna. On the low bands, of course, such an arrangement starts to get prohibitively large, so other approaches have to be tried.

3B9 is a long way from most centers of population, so arrival angles will be low. Even on 40 meters, the half-wave above ground required to achieve low angle radiation from a horizontal antenna is 20 meters (67 ft.), so it is much easier to use some sort of vertical. Actually, on 40 meters, that then becomes quite easy. A full-size quarter-wave vertical is just 10 meters (33 ft.) high and takes up almost zero ground space! Of course, like any vertical, it will only work properly with an effective ground system, but for practical purposes this means running out as many radials as you can, of whatever length, in whichever directions they can go. Very few of us have the space to put down a textbook radial mat with, for example, 120 quarter-wave radials at exact spacings of 3 degrees! One of the authors has had great success on 40 meters with an elevated ground-plane consisting of a 10-meter fiberglass fishing pole, with the quarter-wave radiator wire running up its length (held with insulating tape), mounted on an insulating support (old fence post, or whatever) just a meter or so high, with two elevated quarter-wave radials (if you use elevated radials, do not have an earth/ground connection in addition). Feed the center of the coax to the vertical radiator and attach the outer to the radials.

Rigs and Operating Techniques

Having discussed the antenna system, what about your transceiver? The answer is that most transceivers these days

Don Beattie, G3BJ, with Robert Felicite, 3B9FR, the only resident amateur on Rodrigues, on a scouting trip to the island. (Photos courtesy of the authors)

are more than capable of doing the job, and nearly all elderly ones are, too. The only feature you will need that you may not be using in your day-to-day ragchewing is split-frequency capability. 3B9C, like almost all DXpeditions, will operate split frequency at all times in the early parts of the expedition, although later we may revert to working co-channel, when the pile-ups diminish, for those without the capability.

What is split-frequency operation and why is it used? Quite simply, DXpeditions transmit on one frequency and listen on others. For example, they will transmit on 28.495 MHz and listen between 28.500 and 28.520 MHz. There are two reasons:

1. If the DXpedition station listens on the frequency on which it is transmitting, it will not be heard by those calling because of the pile-up on that frequency.

2. The DXpedition operator will be faced with a huge barrage of calls and will not be able to differentiate between them if they all are calling on the same frequency.

Experienced DXpeditioners will tune slowly up and down their listening band. Listen to the stations working the DXpedition and establish the operator's tuning pattern. Work out where he is likely to be listening next and then call. Bingo! Never, never transmit on the DXpedition's transmitting frequency unless the DXpedition says, "Listening this frequency."

A street scene in Port Mathurin, Rodrigues Island's capital city.

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The two guest suites at the Cotton Bay Hotel, which will be the operating "shacks" for the 3B9C expedition. The grass area will be used for part of the antenna field.

On CW, generally all you will need to do is set your receiver to the 3B9C frequency and then use XIT (transmitter-incremental tuning) to offset your transmitter by the necessary split (see your transceiver manual if you haven't had occasion to do this before). Activating RIT (receiver incremental tuning) will also allow you to hear the calling stations, while leaving your main receive frequency on 3B9C.

RIT and XIT usually only work for splits of up to 10 kHz, which may not be sufficient for SSB operation. In this case, you need to bring your second VFO into operation. Set, say, the A VFO on the 3B9C frequency. Set the B VFO on the frequency where 3B9C is listening, and activate "Transmit on B, Receive on A." Again, your transceiver's manual will explain how to do this.

When 3B9C responds to your call, the exchange will consist simply of an exchange of signal reports. Make sure the 3B9C operator also has your callsign correct. The reason for the short, contest-style exchange is simple: The expedition operators want to maximize the number of people who get a chance to work 3B9C, so contacts are kept as short as possible. Information such as QSL route, etc., have been announced in this magazine and elsewhere, and there will even be a log lookup facility on the 3B9C web page so you can be sure that you are in the log OK. If not, then do feel free to have a second attempt. If your contact is, indeed, OK, then please try to work 3B9C on other bands and modes.

Where on the bands will you find 3B9C? The plan is to focus initially on the frequencies listed below, subject to change for technical or operational reasons. In any case, the team is well aware that band plans in some countries, including the USA, restrict certain classes of operator to sub-sections of the band. This will not only be reflected in the range of listening frequencies used, but in transmitting frequencies as the DXpedition progresses. With widespread use of PacketCluster (via VHF/UHF and the internet) and the DX Summit web pages, even if you don't hear 3B9C immediately, you should always be able to find out very easily where the expedition is currently operating.

MHz	CW	SSB	RTTY
1.8	1822	1842	N/A
3.5	3502	3795	3570
7	7002	7047	7035
10.1	10102	N/A	N/A
14	14022	14195	14085
18	18072	18145	N/A
21	21022	21295	21085
24.9	24892	24945	N/A
28	28022	28595	28075
50	50102	50145	N/A

PSK31 activity will be around 14071, 21071, and 28071 kHz.

Satellite will be via AO-40, and any EME (Earth-Moon-Earth) operation will take place on 70 cm.

The beach area at the Cotton Bay Hotel, where the low frequency antennas will be sited.

The Nevada Rodrigues Trophy, which will be awarded to individuals and groups working 3B9C on the greatest number of different bands and modes.

Regarding the above frequencies, note that the team is aware of at least one other major DXpedition to be active while 3B9C is still on the air, so they may decide to change transmitting frequencies to avoid confusion. Typically, a DXpedition SSB station transmitting on 14.195 MHz will listen up in the range 14.200 to 14.220 MHz. If 3B9C finds itself operating on the same transmit frequency as another DXpedition, it will, for example, move down around 5 kHz, typically to 14.190 MHz, and will then listen down, say, between 14.165 and 14.185 MHz so as to split the pile-ups and avoid confusion.

Listen carefully to the operator. Each has been briefed to give the 3B9C call-sign at least after every two QSOs and to announce the listening frequencies every five QSOs. Incidentally, 3B9C will not work by numbers, believing that with good ears and equipment this is quite unnecessary.

There really isn't the space here to discuss how to get started with the more specialized bands and modes, but the team does encourage readers to have a go. There have been many articles written about getting started on RTTY and PSK-31, which is straightforward using a personal computer and its built-in sound card. There will be a section on the 3B9C website giving some hints and tips, with links to useful references. The same is true of satellite and EME. The latter requires a well-equipped station, but satellite operation through AO-40 doesn't require large investments in equipment, especially if you already have a 70-cm multimode radio (3B9C will be using the popular FT-847) and 70-cm Yagi. Again, follow the links on the web page for suitable advice on getting started.

Nevada Rodrigues Trophies

As an encouragement to both individuals and clubs to work 3B9C on a wide range of bands and modes, Nevada Communications of the UK is sponsoring some trophies to be known as the Nevada Rodrigues Trophies. There are 22 separate categories, covering all continents, both newly licensed operators and old-hands, SWLs, and club entries. The trophies themselves will be an attractive locally made model of a sailing pirogue, as used by the Rodrigues Islanders. For those who don't qualify for a trophy but hit predetermined numbers of band-slots, there will be a range of certificates. Full rules and how to apply can be found on the 3B9C website.

Sponsorship

A significant number of sponsors, led by Principal Sponsor Yaesu, are already supporting this DXpedition. A color brochure has been prepared about the project and has recently been circulated to DX clubs throughout the world. If any club is interested in sponsoring Project Star Reach, please contact Bob Beebe, GU4YOX (e-mail <gu4yox @cwgsy.net>).

We very much hope this article has inspired those of you who are inexperienced in DXing to have a go and work 3B9C. You could be pleasantly surprised at what is possible. We look forward to putting your call in the log. ■

URLs

3B9C: <www.fsdxa.com/3b9c>
DX Lab (includes PropView): <http://www.qsl.net/dxlab/>
DX Summit (DX spots): <http://oh2aq.kolumbus.com/dxs/>
DX Zone (List of propagation prediction programs): <http://www.dxzone.com/catalog/Software/Propagation/>
VOAcap Download: <http://elbert.its.bldrdoc.gov/hf.html>
W6EL Propagation Software: <http://www.qsl.net/w6elprop/>

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Results of the 2003 CQ WW WPX CW Contest

BY STEVE MERCHANT,* K6AW

The 2003 running of the CQ WW WPX CW Contest was both exciting and unpredictable. Although many operators felt that conditions had fallen off, especially on the high bands, log submissions were up and twelve new world records were set. Add to that the always-uncertain late May propagation, and you have the recipe for a fun weekend.

Rookie entrant Donata, SP5HNK, is shown here after the contest. She celebrated her 20th birthday a week after the contest. (Photo by Henryk Kotowski, SMØJHF)

DX

Cape Verde again figured prominently in the Single Op, All Band (SOAB) standings with first-place and new world and continental records going to Al, 4L5A, operating as D4B. Second place was taken by Pertti, OH2PM, from EA8BH. PRØF, operated by YU1RL, was third, and Scott, KØDQ/A92DQ, was fourth from P41P. OC4WW with Olli, OHØXX, operating was fifth, and Jussi-Pekka, OH6RX, operated CT9A for sixth place. Tom, W2SC, was seventh from his 8P1A station; P4ØL with John, W6LD, op was in eighth place; low power CT3EE (Con, DF4SA, op) was ninth; and George, K5KG/J75KG, was tenth from J7A.

ZW5B, with Soni, PY1NX, operating, easily took the 10 meter category, followed by Lucas, LU1FAM's low power entry in second; Jesus, LU5FC, third; Cesar, LU3HIP, fourth; and Carlos, LW1EXU, fifth, the last two also low power. On 15 meters it was PX2W (PY2YU op), in first; Pedro, CX5BW, second; Vlad, 9H1ZA, third; Mark, KD4D, fourth; and Joel, KG6DX, in fifth place. On 20 meters it was Mike, KH6ND, who took first place and set a new continental record (his fourth Oceania world record in this contest), followed by SN7Q second;Vaho, 4L8A, in third; Emil, 9A9A, fourth; and OK1RF fifth. Forty meters was won by YW1D (Paolo, YV1DIG op), with Andy, TA3/G3AB, taking second and a new continental record; 9K9X (Faisal, 9K2RR op) third; Tine, S50A, fourth; and Tom, K1KI, set a new US record in fifth place as KG1D. Eighty meters was a tight race, with Eugen, 9A7V, narrowly beating out Robert, 9A5E. In third was Slavko, S57DX; fourth was Victor, RV2FW; and fifth place went to Boban, YZ1AU. One-sixty meters was won by 4X3A (Riki, 4X4NJ op); Marko, OH3XR, was second; low power entrant Leonid, UX5NQ, third;Janusz, SP2GJV, fourth (also low power); and fifth place went to Jacek, SP5DRH.

In the low power division, first place was taken by CT3EE (Con, DF4SA op); PR2F (Rafael, PY2NDX op) was second; Fazil, TA3DD third; Filipe, CT1ILT, fourth; and LY7Z (Andrius, LY2TA op) fifth. Ten meter single band honors went to LU1FAM in first; LU3HIP was second; LW1EXU third; 5NØW (Vaclav, OK1DXE op) fourth; and YBØECT in fifth. On 15 meters it was L71F (Fabian, LU1AEE) in first; Tomaz, S59W, second; YT9X (Darko, YZ1KA op) third; Art, BW4/UA3VCS, fourth; and AN7WA in the fifth spot. Twenty meters was dominated by Vitor, PY2NY; with M4K (Tim, MØBEW op) second; S57Z third; A45WD (Alex, YO9HP op) fourth; and Scott, VE1OP, in fifth place. On 40 meters it was 4XØX with Zakhar, 4Z5AX, operating for first place; Sasha, 4N1FG, second; LY5A (LY2PAJ op) third; LY6A (Rimas, LY2BM op) fourth; and YZ1V (Aleks, YT1HA

Trey, N5KO, prepares for the winning HC8N Multi-Two entry.

*e-mail: <k6aw@cqwpx.com>

TROPHY WINNERS AND DONORS

SINGLE OPERATOR, ALL BAND

WORLD: Steve Bolia, N8BJQ Trophy. Won by: **D4B operated by Alexander Teimurazov, 4L5A.**
USA: Dennis Motschenbacher, K7BV Trophy. Won by: **NE4AA operated by Dan Street, K1TO.**
EUROPE: Ivo Pezer, 5B4ADA/9A3A Trophy. Won by: **Ranko Boca, YT6A.**
OCEANIA: Tom Morton, K6CT Trophy. Won by: 3D2NC operated by **Nikola Cimbur, AC6DD.**
CANADA: Radio Amateurs of Canada (RAC) Trophy. Won by: **VY2TT operated by Ken Widelitz, K6LA.**
JAPAN: The DX Family Foundation Trophy. Won by: **Masa Okano, JH4UYB**.
WORLD LOW POWER: Steve Bolia, N8BJQ Trophy. Won by: **CT3EE operated by Cornelius Paul, DF4SA.**
USA LOW POWER: Steve Bolia, N8BJQ Trophy. Won by: **Charles Fulp, K3WW.**
ZONE 3 HIGH POWER: Jim Pratt,N6IG Trophy. Won by: **KU6W operated by Daniel M. Craig, N6MJ.**
USA ZONE 4 HIGH POWER: Society of Midwest Contesters Trophy. Won by: **NT5C operated by Jim George, N3BB.**
USA ZONE 4 LOW POWER: Society of Midwest Contesters Trophy. Won by: **John Bayne, KK9A.**

SINGLE OPERATOR, SINGLE BAND

WORLD: Pedro Piza Sr, KP4ES Memorial Trophy. Won by: **YW1D operated by Paolo Stradiotto, YV1DIG (7 MHz).**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **Andy Chadwick, TA3/G3AB.**
WORLD 3.5 MHz: Lance Johnson Digital Graphics Trophy. Won by: **Eugen Calopa, 9A7V.**
USA: Kansas City DX Club Trophy. Won by: **Gene Walsh, N2AA (14 MHz).**
USA 28 MHz: Bernie Welch, W8IMZ Memorial Trophy. Won by: **NE5D operated by Jim Eppright, K5RX.**
USA 21 MHz: Wayne Carroll, W4MPY Trophy. Won by: **Mark Bailey, KD4D.**

MULTI-OPERATOR, SINGLE TRANSMITTER

WORLD: Ron Blake, N4KE Trophy. Won by: **Station PT5A operated by PY1KN, PY2EMC, PY2NQ, PY3DX, PP5JR .**
ASIA: W2MIG Memorial (NT4TT Sponsor). Won by: **Station A61AJ operated by A61AJ, DL2CC, T97C, DK1MM, ON5NT, SM7PKK.**
USA ZONE 4: Society of Midwest Contesters Trophy. Won by: **Station WO8CC operated by N8NR & N9AG.**

MULTI-OPERATOR, MULTI-TRANSMITTER

WORLD: Steve Merchant, K6AW Trophy. Won by: **Station NY4A operated by K2AV, K4QPL, N4AF, and W2CS.**
USA: Yankee Clipper Contest Club Trophy. Won by: **Station NQ4I operated by NQ4I, N5QQ, K8JQ, AA4LR, AA4S, KL9A, W7FB, W4DD.**

CONTEST EXPEDITION

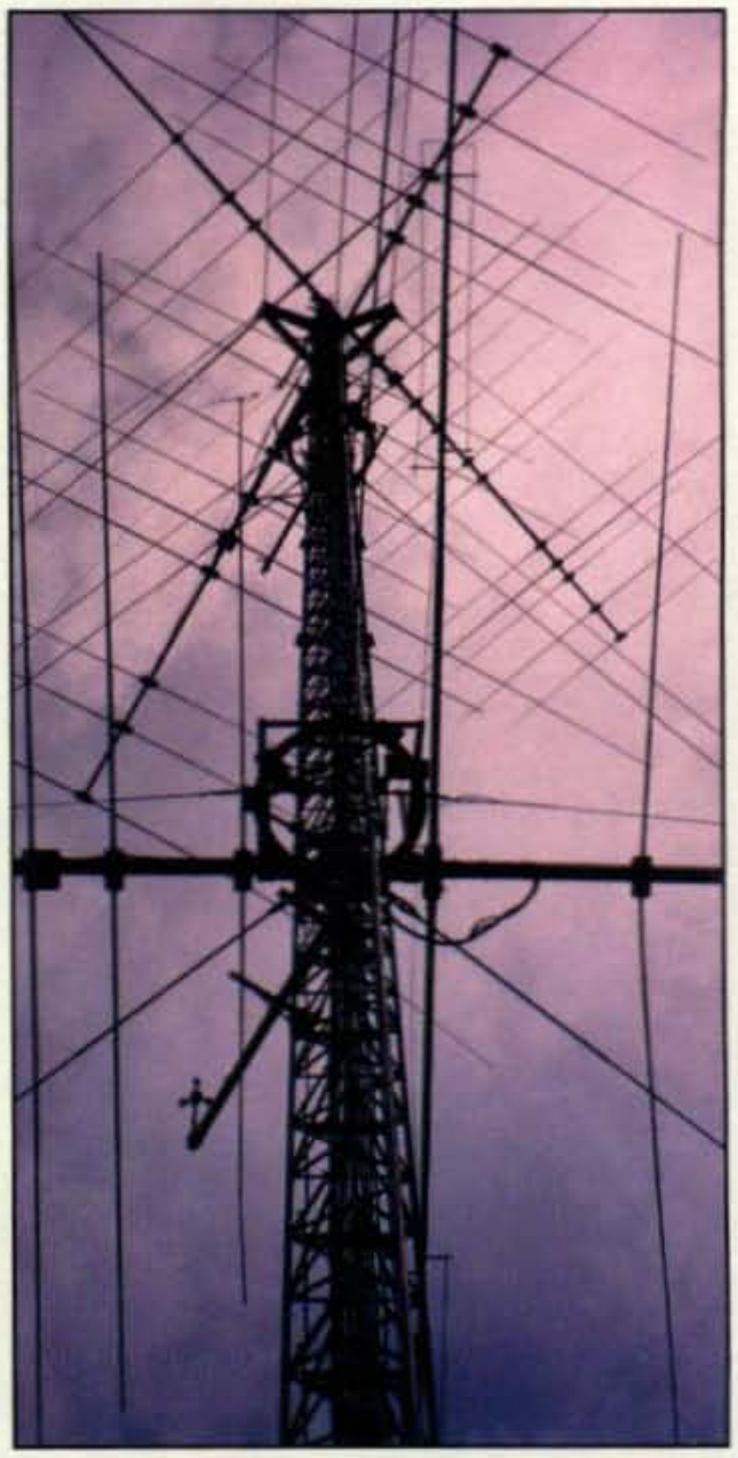
WORLD: Steve Bolia, N8BJQ Trophy. Won by: **Station HC8N operated by N5KO, AC6T, N6XI, and W6RGG.**

COMBINED SSB/CW
SINGLE OPERATOR, ALL BAND

WORLD: Al Slater, G3FXB Memorial. Won by: **D4B operated by Alexander Teimurazov, 4L5A.**

Club (SSB & CW)

WORLD: CQ Magazine Trophy. Won by: **Northern California Contest Club.**
USA: Oklahoma DX Association Trophy. Won by: **Potomac Valley Radio Club.**



The impressive antenna array at VC1R (AE6Y at VE1JF).

op) fifth. Eighty meters was a tight race with YO2KJI (YO2DFA op) in first; Vinko, S53F, second; YTØT (Acim, YU1YV op) third; HA8LLS fourth; and Zdenek, OK1XUV, fifth. The 160 meter winners were Leonid, UX5NQ, first; Janusz, SP2GJV, second; Rad, YU1RA, third; Dusan, YU1EA, fourth; and Arturas, LY2GW, fifth.

The popular Tribander/Single Element category was totally dominated this time by OH6RX operating from CT9A. Second place went to George, K5KG/J75KG, as J7A; third place went to another CT operator, Ricardo, CT3KN; while EA1DX (Daniel, EA5FV op) was fourth; and Alex, RZ3AZ, fifth.

Rookie honors went to CT1ILT in first place. Yura, UR5HAC, was second; Lidija, YT1LT, third; Vygis, LY2XW, was fourth (all four low power); and Donata, SP5HNK, fifth.

Single-op Assisted honors went to TO5AA (Jack, RW3QC op) in first. Yuri, UA9AM, was second; Pavel, OD5/OK1MU, third; George, JY9QJ, fourth; and IR9T (Fabio, IT9GSF op) in fifth place.

QRP/p was won by Didier, FY5FY, followed by TI5N (Bill, W8QZA op); Gyorgy, HG5Z, in third; YT7TY fourth; and SM3C (Bengt, SM5CCT op) in fifth. Marat, EW6CU, took top honors on 10 meters; Sergei, RZ6HX, won on 15; and 20 meters was won by OL4W (Milan, OK1IF op). Forty meters went to S54AA, and OM3THV took 80 meters first place.

USA

The U.S. SOAB race was won handily by Dan, K1TO, operating his big Florida station as NE4AA and crushing his closest competitor by nearly 2 million points. Second place went to Dick, WC1M, while Dan, N6MJ, took third from the West Coast, operating KU6W. In fourth place was K3CR (Alex, LZ4AX op). Eric, K3NA, was fifth; Bob, W4MYA, sixth; Jim, N3BB, seventh as NT5C; Doug, N6RT, eighth from W6EEN's place as NE6N; Chuck, NK4A, in ninth place; and Jeff, WC4E, as the Floridian at the other end of the box in the number 10 spot.

NE5D (Jim, K5RX op) took first on 10 meters, followed by Joe, W6VNR, in second; George, KG1V, third; Ed, KN4Y/M, fourth; and Gert, K5WW, fifth, the last three all low power. On 15 meters it was Mark, KD4D, first; NX5M (Vlad, UAØOFF op) second; Bert, K2BA, third; John, K4OAQ, fourth; and Ken, K1UM, fifth. Twenty meters saw a real battle for first place between Gene, N2AA, and Bill, K1GQ, operating KC1XX. Gene edged out Bill in the end by a very slight margin. Third place went to WW4R (Don, K4WX op); fourth to Mike, K9NW; and fifth to John, K2VV. Forty meters was won decisively by Tom, K1KI, as KG1D, setting a new North American record. Second place went to Ted, KT1V; third to Alex, KU1CW; fourth to low power NO4S; and fifth place to Dave, K4SV. Eighty meters was won by Bruce, K6OY, with John, K1VW, close behind in second place, followed by Mike, W7DRA/7, fourth, and Dick, KX9DX, fifth, the last two low power.

In the U.S. Low Power division it was Chas, K3WW, taking first place, followed by John, KK9A, second; Steve, NY3A, third; KT8X (Ken, W8MJ op) fourth; and NN5P

(Ed, N1UR op) fifth. On 10 meters it was KG1V first, KN4Y/M second, and K5WW third. On 15 meters it was Len, WB4TDH, first; Gheorghe, N2GM, second; Paul, NG7Z, third; Jim, K9WA, fourth; and Becky, K6EY, fifth. Twenty meters was won by Yuri, W2/UR5DEM, with Bob, K8IA, second; Gerry, K9BG, third; Ken, WØETT, fourth; and Marion, W6NKR, in fifth place. The 40 meter winner was NO4S, with Bob, AK6R, second; Dave, W4IDX, third; Roy, WK4Y, fourth; and Mal, N7MAL, fifth. Eighty meters was won by W7DRA/7, with KX9DX second.

The Tribander/Single Element category was won by Martin, K2PLF, with KQ7M (Valeriy, N2WW op) second; Terry, N6CW, third; Joe, KZ5D, fourth; and Norm, W1MO, fifth. The Rookie category was won by Dick, AI3M, with Randy, W6SJ, second; Dave, KB9YOZ, third; Ricky, W2RDS, fourth; and Leroy, N7EIE, fifth, all five low power.

Single-Op Assisted was won by WM4RM (Bill, W4RM op), with WPX Director Emeritus Steve, N8BJQ, second; Darrell, AB2E, third; Barry, W5GN, fourth; and Brian, K3KO, fifth.

The QRP/p division was won by Gary, N7IR, followed by Roger, W8VE, in second; Bob, N4HY, third; Dick, K9BWI, fourth; and Ken, WA8REI, fifth. Fifteen meters was won by WA6FGV; 20 meters by Dave, WA8WV; and 40 meters by Bruce, W1CVE.

Multi-Ops

The popular Multi-Single category was won by PT5A, followed closely by A61AJ second and ZF1A third, all three within a 500k point spread. Fourth place went to YM2ZF, fifth to OM7M, and sixth to AN6IB. EN7Z was seventh, HC1S eighth, ZM1A ninth, and OL3A was tenth.

In the U.S., top Multi-Single honors went to NO5W, with NZ1U second, K9ES third, WO8CC fourth, and K4NNN fifth. N3AD was sixth, KC9ARR seventh, NF1D eighth, W4ZE ninth, and NØKE tenth.

The new Multi-Two category saw a lot of action. Four ops went to HC8N and scored over 30 million points to establish the world record for this category and the most points of any entry in the contest. Second place went to R3ØØSP, followed closely by KM4M in third, ZL6QH fourth, and RT9W in fifth place. It was a real battle for the second place, as there was only a 700k point spread between the second- and fifth-place entries. Sixth place went to RO4M/6, with OH1F seventh, LY4CW eighth, OL7W ninth, and UU7J tenth. In the U.S., KM4M won Multi-Two, with KX7M second, WX5S third, and NG3U fourth. See the World Records box for the continental winners in this new category.

The world Multi-Multi winner was a U.S. station, NY4A, followed by LZ9W second, NQ4I third, LY7A fourth, NN5J fifth, YL7C sixth, OZØXX seventh, ZX3S eighth, OH2K ninth, and OK7K tenth. In the U.S. the Multi-Multi winner was NY4A, with NQ4I second and NN5J third.

The Rest of the Story

Log submissions were up and the percentage of logs sent electronically increased as well. We continue to work on improvements for the log robots. Remember, you can keep submitting your log to the robot

WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

D4B (4L5A)	15,185,170
EA8BH (OH2PM)	13,149,465
PRØF (YU1RL)	12,802,125
P41P (KØDQ/A92Q)	12,051,994
OC4WW (OHØXX)	11,415,764
CT9A (OH6RX)	11,257,028
8P1A (W2SC)	11,021,020
P4ØL (W6LD)	9,490,320
*CT3EE (DF4SA)	9,401,532
J7A (K5KG/J75KG)	8,367,519
*PR2F (PY2NDX)	7,969,896
PJ2W (WI9WI)	7,737,660
NE4AA (K1TO)	7,547,408
VY2TT (K6LA)	7,309,631
VC1R (AE1Y @ VE1JF)	6,900,984
YT6A	6,622,488
HC1OT (K6AW)	6,299,656
WC1M	5,656,144
KU6W (N6MJ)	5,611,993
K3CR (LZ4AX)	5,576,550

28 MHz

ZW5B (PY1NX)	4,090,515
*LU1FAM	2,448,497
LU5FC	2,318,400
*LU3HIP	1,031,610
*LW1EXU	952,289
9A5Y (9A3LG)	477,835
NE5D (K5RX)	225,500
*5NØW (OK1DXE)	184,851
SP9W	161,980
UN7LZ	98,778

21 MHz

PX2W (PY2YU)	4,616,150
CX5BW	4,004,397
9H1ZA	2,898,720
KD4D	2,268,332
KG6DX	1,932,832
TM9R (F6IRA)	1,859,834
DL3TD	1,843,670
UN6GN	1,778,340
NX5M (UAØOFF)	1,528,956
IV3IYH	1,438,618

14 MHz

KH6ND (@KH7R)	4,126,690
SN7Q	3,997,145
4L8A	3,771,138
9A9A	3,729,528
OK1RF	3,685,770
S58A	3,614,334
VC6A (VA7RR)	3,560,505
GS2MP (GM4FAM)	3,300,678
N2AA	3,283,892
KC1XX (K1GQ)	3,148,370

7 MHz

YW1D (YV1DIG)	4,951,152
TA3/G3AB	4,266,512
9K9X (9K2RR)	3,534,382
S5ØA	3,020,544
KG1D (K1KI)	2,999,854
A61AR (RV6LNA)	2,987,817
OK1CF	2,577,459
LU1FGE	2,358,577
HG9X (HA9PP)	2,316,480
YP3A (YO9GZU)	2,239,303

3.5 MHz

9A7V	773,721
9A5E	750,420
S57DX	622,278
RV2FW	584,330
YZ1AU	563,552
SN8F (SP8FHK)	550,278
YU1KR	485,080
LY2BW	482,760
*YO2KJI (YO2DFA)	473,841
YR5A (YO5OHO)	466,697

1.8 MHz

4X3A (4X4NJ)	239,135
OH3XR	125,450
*UX5NQ	121,149
*SP2GJV	103,761
SP5DRH	95,288
*YU1RA	74,256
*YU1EA	51,348
DL7CX	46,125
*LY2GW	45,125
*ER1OO	22,568

LOW POWER ALL BAND

CT3EE (DF4SA)	9,401,532
PR2F (PY2NDX)	7,969,896
TA3DD	4,032,103
CT1ILT	3,697,200
LY7Z (LY2TA)	3,693,162
SU9NC	3,578,872
LU5FF	3,445,488
K3WW	3,050,916
TK/S52A (S59AA)	2,976,190
3D2NC (AC6DD)	2,924,598
C8A (ZS6MG)	2,885,236
KK9A	2,782,800
AM7RM	2,739,910
OK2PP	2,610,861
HG8I	2,560,744
UA4FER	2,419,466
IR2Y	2,417,500
T97M	2,412,112
NY3A	2,052,155
KT8X (W8MJ)	2,027,355

28 MHz

LU1FAM	2,448,497
LU3HIP	1,031,610
LW1EXU	952,289
5NØW (OK1DXE)	184,851
YBØECT	97,382

21 MHz

L71F (LU1AEE)	1,039,934
S59W	1,010,446
YT9X (YZ1KA)	674,928
BW4/UA3VCS	554,561
AN7WA	550,352
RA3AN	399,280
YY5YMA	359,988
WB4TDH	345,092
SV1ENG	339,405
US7IGF	337,696

14 MHz

PY2NY	2,068,122
M4K (MØBEW)	1,769,362
S57Z	1,681,598
A45WD (YO9HP)	1,525,150
VE1OP	1,459,872
HG4F	1,246,416
W2/UR5DEM	1,216,047
UW8M	1,195,056
EN1I (US1ITU)	1,036,000
UA3DNR	957,528

7 MHz

4XØX (4Z5AX)	1,614,714
4N1FG	1,211,826
LY5A (LY2PAJ)	1,191,224
LY6A (LY2BM)	1,139,544
YZ1V (YT1HA)	1,120,878
S54A	1,102,608
UT1FA	1,099,560
UY6IM	940,824
SP5JTF	858,432
I2IFT	800,316

3.5 MHz

YO2KJI (YO2DFA)	473,841
S53F	384,978
YTØT (YU1YV)	346,983
HA8LLS	322,025
OK1XUV	303,199
LZ2L (LZ2LDS)	277,916
EU6DX	225,828
LY3CW	225,400
T94DJ	213,666
YU7QL	125,832

1.8 MHz

UX5NQ	121,149
SP2GJV	103,761
YU1RA	74,256
YU1EA	51,348
LY2GW	45,125

TRIBANDER/SINGLE ELEMENT

CT9A (OH6RX)	11,257,028
J7A (K5KG/J75KG)	8,367,519
CT3KN	5,452,378
EA1DX (EA5FV)	3,879,704
RZ3AZ	3,668,311
*LU5FF	3,445,488
*TK/S52A (S59AA)	2,976,190
RA9SG	2,932,772
*3D2NC (AC6DD)	2,924,598
*AM7RM	2,739,910
K2PLF	2,722,896
*IR2Y	2,417,500
*T97M	2,412,112
HA3LI	2,370,690
JA7DLE	2,227,407

ROOKIE

*CT1ILT	3,697,200
*UR5HAC	1,720,278
*YT1LT	1,426,128
*LY2XW	893,748
SP5HNK	683,700
*AI3M	397,065
*SQ9MZ	297,040
*F6ABI	83,569
*W6SJ	65,664
*DJ9AO	62,720

SINGLE OPERATOR, ASSISTED

TO5AA (RW3QC)	10,318,875
UA9AM	6,303,075
OD5/OK1MU	6,262,286
JY9QJ	5,604,885
IR9T (IT9GSF)	5,099,772
OHØB (OH2JTE)	4,790,570
HG6N (HA3OV)	4,642,164
DL6FBL	4,560,192
RM3C (RA3CW)	4,143,304
YLØA (YL2KA)	3,363,750
WM4RM (W4RM)	3,309,966
DK3GI	2,929,586
N8BJQ	2,749,680
AB2E	2,735,810
*S52ZW	2,599,230

QRP/p

FY5FY	A	2,359,486
TI5N (W8QZA)	A	1,596,114
HG5Z	A	1,361,876
YT7TY	A	1,202,248
SM3C (SM5CCT)	A	690,404
LY3BY	A	557,004
N7IR	A	469,812
GW4ALG	A	397,488
G3YMC	A	382,410
GØDCK	A	359,597
EW6CU	28	12,194
JR3RWB	28	10,512
DL9NEI	28	5,865
RZ6HX	21	268,256
YU1LM	21	207,603
G2HLU	21	42,340
OL4W (OK1IF)	14	291,489
G3LHJ	14	225,600
UN7CN	14	221,364
WA8WV	14	199,185
OK1DSA	14	180,516
S54AA	7	485,298
OK1IR	7	275,892
RW6HX	7	220,274
7S3J (SMØDZH)	7	157,680
US5QQF	7	132,600
OM3THV	3.5	113,263
SP4TBM	3.5	12,750
US8IBS	3.5	8,437

MULTI-OPERATOR SINGLE TRANSMITTER

PT5A	14,158,420
A61AJ	13,754,804
ZF1A	13,636,728
YM2ZF	10,783,872
OM7M	8,154,091
AN6IB	7,515,452
EN7Z	7,493,886
HG1S	7,427,619
ZM1A	6,936,448
OL3A	6,001,376
NO5W	5,996,820
OE2S	5,689,620
S5ØU	5,665,092
CK7SV	5,429,956
RW9C	5,389,332

MULTI-OPERATOR TWO TRANSMITTER

HC8N	30,928,268
R3ØØSP	12,793,452
KM4M	12,395,116
ZL6QH	12,029,472
RT9W	12,006,568
RO4M/6	8,585,466
OH1F	8,250,396
LY4CW	8,004,738
OL7W	7,310,688
UU7J	6,670,932
PI4COM	6,279,120
KX7M	5,750,379
WX5S	4,649,494
OT3A	4,178,195
SJ5AA	3,169,952

MULTI-OPERATOR MULTI-TRANSMITTER

NY4A	14,537,984
LZ9W	13,294,575
NQ4I	11,602,944
LY7A	8,961,169
NN5J	8,280,338
YL7C	4,362,264
OZØXX	4,314,870
ZX3S	3,948,860
OH2K	1,959,375
OK7K	1,338,970

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MFJ Sound Card-to-Rig Interface

Use sound card and rig for all digital modes!

Plug and Play -- includes software, all cables, AC power supply . . . RFI-proof . . . Isolation transformers -- no hum, noise, distortion . . . Operate PSK-31, packet, APRS, AMTOR, RTTY, SSTV, CW, Meteor Scatter, others . . . Use as Voice Keyer, CW Contest Memory Keyer . . . Monitor On/Off Switch . . .

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Operate PSK-31, packet, APRS, AMTOR, RTTY, SSTV, CW, high speed CW Meteor Scatter and many others. Also use as Contest Voice Keyer and CW Contest Memory Keyer.

Digital Modes or Normal Operation

Select the ON digital mode -- all connections are made between your rig and computer for instant digital operation.

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Audio isolation transformers and relay eliminate ground loops, audio hum, noise and distortion.

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Extensive RF suppression and line isolation eliminates RF feedback problems.

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Transmit mic audio at any time by pressing PTT to override digital modes -- great for SSTV and Contest Voice Keyer.

More Impressive Features

Serial port -- lets computer control radio to override/interrupt digital transmissions.

VOX Control -- lets you use VOX control when not using computer serial port control.

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Off-the-air recording -- for replaying or for use with spectrum analyzer programs.

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Rugged Construction -- All aluminum cabinet and surface-mount construction gives you years of trouble-free service.

Use any Transceiver

Internal jumpers program microphone wiring for any brand or model radio -- no soldering required. Order **MFJ-1275** for 8-pin *round* mic plug. Order **MFJ-1275M** for 8-pin *modular* mic (RJ45) plug.

NEW! Order MFJ-1275T, for *4-pin round* mic plug, for Ten-Tec and others.

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Everything you need is included --audio and RS-232 cables, AC power supply and a CD with a collection of the most popular amateur radio software to operate PSK-31, RTTY, SSTV, PACKET, AMTOR, CW, HSCW Meteor Scatter, Contest Voice Keying and other modes. Use 12 VDC or 110 VAC.

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This *super* sound card interface has all of the features of the MFJ-1275 ***plus . . .***

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- **Footswitch:** Use footswitch or other for PTT (push-to-talk) when not using VOX.

Plug and Play! Includes software CD, RS-232 and audio cables, AC power supply.

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USA TOP SCORES

SINGLE OPERATOR ALL BAND

NE4AA (K1TO)	7,547,408
WC1M	5,656,144
KU6W (N6MJ)	5,611,993
K3CR (LZ4AX)	5,576,550
K3NA	5,376,540
W4MYA	4,916,856
NT5C (N3BB)	4,386,816
NE6N (N6RT)	4,321,746
NK4A	4,160,688
WC4E	3,995,280
AA3B	3,979,728
K3ZO	3,920,255
KT5I (K5PI)	3,598,175
WR3Z	3,552,400
NU1P (K1MK)	3,434,165

28 MHz

NE5D (K5RX)	225,500
W6VNR	1,794
*KG1V	1,794
*KN4Y/M	1,568
*K5WW	1,155

21 MHz

KD4D	2,268,332
NX5M (UAØOFF)	1,528,956
K2BA	966,273
K4OAQ	961,920
K1UM	358,440

14 MHz

N2AA	3,283,892
KC1XX (K1GQ)	3,148,370
WW4R (K4WX)	2,907,359
K9NW	2,729,272
K2VV	2,469,962
N4OGW	2,373,360
NR9J (N9TK)	2,061,387
K7ZZ	1,257,149
*W2/UR5DEM	1,216,047
N8II	1,001,070

7 MHz

KG1D (K1KI)	2,999,854
KT1V	1,964,955
KU1CW	952,614
*NO4S	583,646
K4SV	403,221

3.5 MHz

K6OY	153,940
K1VW	140,086
*W7DRA/7	4,025
*KX9DX	2,680

LOW POWER A BAND

K3WW	3,050,916
KK9A	2,782,800
NY3A	2,052,155
KT8X (W8MJ)	2,027,355
NN5P (N1UR)	1,726,776
KG5U (K5WA)	1,633,263
WD4AHZ	1,504,126
K4OGG	1,489,334
WJ9B	1,410,643
WO4O	1,396,560
WD5K	1,311,106
NA4K	1,250,970
KS1J	1,243,150
N5DO	1,182,483
NR3X (N4YDU)	1,132,404

28 MHz

KG1V	1,794
KN4Y/M	1,568
K5WW	1,155

21 MHz

WB4TDH	345,092
N2GM	215,646
NG7Z	48,792
K9WA	26,450
K6EY	7,502

14 MHz

W2/UR5DEM	1,216,047
K8IA	905,465
K9BG	707,332
WØETT	239,856
W6NKR	97,318

7 MHz

NO4S	583,646
AK6R	135,707
W4IDX	119,483
WK4Y	95,316
N7MAL	69,708

3.5 MHz

W7DRA/7	4,025
KX9DX	2,680

TRIBANDER/SINGLE ELEMENT

K2PLF	2,722,896
KQ7M (N2WW)	2,191,266
N6CW	2,010,280
KZ5D	1,972,500
W1MO	1,956,636
N2GC	1,952,190
N3UM	1,668,615
*WD4AHZ	1,504,126
KW5DX (K1LL)	1,417,647
KA2MGE	1,327,149
*WD5K	1,311,106
K4BAI	1,295,796
K9WIE/Ø	1,268,798
NJ2NJ (AA5B)	1,263,920
*NA4K	1,250,970

ROOKIE

*AI3M	397,065
*W6SJ	65,664
*KB9YOZ	44,671
*W2RDS	19,040
*N7EIE	10,640

SINGLE OPERATOR ASSISTED

WM4RM (W4RM)	3,309,966
N8BJQ	2,749,680
AB2E	2,735,810
W5GN	1,902,234
K3KO	1,844,594
*WN9O (W9IU)	1,653,752
KC1F	1,389,767
N4WW	1,144,829
K3WA	1,021,515
W3FV	960,630
*W1EBI	820,919
N5JR	645,280
K9UQN	558,484
*W1RM	547,690
W3HVQ	480,080

QRP/p

N7IR	A	469,812
W8VE	A	171,600
N4HY	A	163,240
K9BWI	A	128,480
WA8REI	A	102,238
WA6FGV	21	31,242
AE9F	21	25,538
WA8WV	14	199,185
NU4B	14	137,080
W6YJ	14	108,216
W1CVE	7	9,348
N2JNZ	7	8,296
NE6M	7	5,220

MULTI-OPERATOR SINGLE TRANSMITTER

NO5W	5,996,820
NZ1U	4,634,914
K9ES	2,572,885
WO8CC	2,410,320
K4NNN	2,359,110
N3AD	2,007,135
KC9ARR	1,180,920
NF1D	558,546
W4ZE	518,654
NØKE	371,127

MULTI-OPERATOR TWO TRANSMITTER

KM4M	12,395,116
KX7M	5,750,379
WX5S	4,649,494
NG3U	2,880,100

MULTI-OPERATOR MULTI-TRANSMITTER

NY4A	14,537,984
NQ4I	11,602,944
NN5J	8,280,338

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up until deadline. If you need to make a change or correction, just make the fix and resubmit the log. This is much faster (and more reliable) than asking the contest director to do it for you.

Thanks to all the stations who get on for this contest. It is a very popular event. We all appreciate the efforts of the groups who travel to rare prefixes so we can work them. Thanks, too, to everyone who has a club call or special event call with a unique prefix. This makes the contest even more fun as operators try to guess who that strange callsign might really be.

Steve Bolia, N8BJQ, has been a lifesaver for me as I learn the ropes of administering this contest. Extra special thanks to Steve for all his help this year.

Halfway through the contest, this photo of sunset in Quito was taken from the shack of HC1OT (K6AW op.).

Expanded results of the WPX contests may be found on the *CQ* magazine website, <http://www.cq-amateur-radio.com>. There are full operator lists, expanded QRM, and other items and photos that don't appear in the magazine. Please forward any comments or suggestions for improving the website material.

The 2004 contest dates are March 27–28 for SSB and May 29–30 for CW. There is a new URL for the contest, <http://www.cqwpx.com>, so logs for the 2004 WPC contests go to <ssb@cqwpx.

CONTINENTAL LEADERS

AFRICA

1.8	No Entry	
3.5	No Entry	
7	CT3KU*	42,840
14	EA8NQ*	471,675
21	D44AC	1
28	5NØW*	184,851
AB	D4B	15,185,170

ASIA

1.8	4X3A	239,135
3.5	JA1IZZ*	168
7	TA3/G3AB	4,266,512
14	4L8A	3,771,138
21	UN6GN	1,778,340
28	UN7LZ	98,778
AB	UA9CDV	5,484,283

EUROPE

1.8	OH3XR	125,450
3.5	9A7V	773,721
7	S50A	3,020,544
14	SN7Q	3,997,145
21	9A8A	3,449,940
28	9A5Y	477,835
AB	YT6A	6,622,488

NORTH AMERICA

1.8	No Entry	
3.5	K6OY	153,940
7	KG1D	2,999,854
14	VC6A	3,560,505
21	KD4D	2,268,332
28	NE5D	225,500
AB	8P1A	11,021,020

OCEANIA

1.8	No Entry	
3.5	No Entry	
7	No Entry	
14	KH6ND	4,126,690
21	KG6DX	1,932,832
28	YBØECT*	97,382
AB	3D2NC*	2,924,598

SOUTH AMERICA

1.8	No Entry	
3.5	PY7OJ*	16,650
7	YW1D	4,951,152
14	PY2NY*	2,068,122
21	PX2W	4,616,150
28	ZW5B	4,090,515
AB	PRØF	12,802,125

MULTI-OPERATOR SINGLE TRANSMITTER

AF	No Entry	
AS	A61AJ	13,754,804
EU	OM7M	8,154,091
NA	ZF1A	13,636,728
OC	ZM1A	6,936,448
SA	PT5A	14,158,420

MULTI-OPERATOR TWO TRANSMITTER

AF	No Entry	
AS	RT9W	12,006,568
EU	R300SP	12,793,452
NA	KM4M	12,395,116
OC	ZL6QH	12,029,472
SA	HC8N	30,928,268

MULTI-OPERATOR MULTI-TRANSMITTER

AF	No Entry	
AS	JA1YPA	211,762
EU	LZ9W	13,294,575
NA	NY4A	14,537,984
OC	No Entry	
SA	ZX3S	3,948,860

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CW & SSB CLUB COMPETITION

NORTHERN CALIFORNIA CONTEST CLUB	**230,082,096**
BAVARIAN CONTEST CLUB	122,297,330
POTOMAC VALLEY RADIO CLUB	**113,964,404**
RUSSIAN CONTEST CLUB	102,985,249
ARAUCARIA DX GROUP	100,488,223
CONTEST CLUB FINLAND	95,758,410
FLORIDA CONTEST GROUP	84,799,523
YANKEE CLIPPER CONTEST CLUB	65,821,030
RHEIN RUHR DX ASSOCIATION	58,419,090
SOCIETY OF MIDWEST CONTESTERS	57,504,554
FRANKFORD RADIO CLUB	48,233,917
KAUNAS UNIVERSITY OF TECHNOLOGY RADIO CLUB	47,492,188
LATVIAN CONTEST CLUB	43,869,746
MARCONI CONTEST CLUB	42,375,802
ATCC	41,693,240
SLOVENIA CONTEST CLUB	40,291,446
TUPY DX GROUP	37,804,896
CONTEST CLUB ONTARIO	36,848,176
URAL CONTEST GROUP	36,178,258
UKRAINIAN CONTEST CLUB	33,903,139
HADXC	32,910,520
LUCG	32,812,558
SOUTH EAST CONTEST CLUB	30,773,714
SOUTHERN CALIFORNIA CONTEST CLUB	29,945,155
GRAND MESA CONTESTERS OF COLORADO	26,405,223
BRITISH COLUMBIA DX CLUB	25,801,996
NORTH TEXAS CONTEST CLUB	24,669,981
WORLD WIDE YOUNG CONTESTERS	23,402,059
CENTRAL TEXAS DX AND CONTEST CLUB	22,257,891
YU CONTEST CLUB	19,733,421
SKY CONTEST CLUB	19,550,398
CHILTERN DX CLUB	18,597,443
TEXAS DX SOCIETY	18,457,797
CROATIAN CONTEST CLUB	17,464,125
TENNESSEE CONTEST GROUP	16,726,798
LES NOUVELLES DX GROUP	16,559,188
CT RI CONTEST GROUP	13,674,823
WESTERN WASHINGTON DX CLUB	13,308,997
LITHUANIAN DX GROUP	12,898,019
SOUTHWEST OHIO DX ASSOCIATON	12,885,421
MAD RIVER RADIO CLUB	12,848,520
KIEV CONTEST GROUP	12,474,845
BASHKORTOSTAN DX CLUB	12,152,324
SP DX CLUB	12,129,038
SARAJEVO CONTEST GROUP	11,597,349
OKLAHOMA DX ASSOCIATION	11,264,199
YO DX CLUB	10,444,384
MOSCOW CONTEST CLUB	10,124,948
TOP OF EUROPE CONTESTERS	9,728,180
HUDSON VALLEY CONTESTERS AND DXERS	9,527,089
KANSAS CITY DX CLUB	9,350,295
CRIMEAN CONTEST CLUB	8,664,870
Z30M CONTEST TEAM	8,404,561
GUARA DX GROUP	8,273,176
CENTRAL SIBERIA DX CLUB	7,950,160
CAJUN CONTEST CLUB	7,444,420
TARTU CONTEST TEAM	7,355,954
WILLAMETTE VALLEY DX CLUB	7,117,749
AMATEUR RADIO INTEREST GROUP: ZS6DDX	6,630,419
TIKIRRIKI CONTEST CLUB	6,474,032
BSB DX GROUP	6,403,717
RADIO CLUB VENEZOLANO	6,155,770
SOUTHERN CROSS DX GROUP	6,058,219
GPDX - PORTUGUESE DX GROUP	5,829,325
MINNESOTA WIRELESS ASSOCIATION	5,230,988
NORTHERN ILLINOIS DX ASSOCIATION	4,779,253
CENTRAL ARIZONA DX ASSOCIATION	4,662,736
VRHNIKA CONTESTERS	4,361,422
GACW (GRUPO ARGENTINO DE CW)	3,828,404
THE PORDENONE GANGSTERS	3,367,112
KONTEST KLUB KRASNODARSKOGO KRAYA	3,078,264
URE	2,919,877
BELOKRANJEC CONTEST CLUB!	2,774,021
UNION FRANCAISE DES TELEGRAPHISTES	2,741,472
FOX CONTEST CLUB	2,435,995
BELARUS CONTEST CLUB	2,303,613
SPOKANE DX ASSOCIATION	2,034,747
SRR	1,909,152
TEMIRTAU CONTEST CLUB	1,888,529
MAGNOLIA DX ASSOCIATION	1,851,478
PUSHKINSKIY RADIOCLUB	1,765,952
KORYAZHMA DX COMPANY	1,687,047
SP CONTEST CLUB	1,607,995
YAROSLAVL RADIO CLUB	1,451,955
ORDER OF BOILED OWLS NEW YORK	1,250,908
SOUTH JERSEY RADIO ASSN	1,249,359
CONTEST CLUB SLOVENIA	1,010,446
CAROLINA DX ASSN	1,008,081
VERON	956,195
NORTH COAST CONTESTERS	886,193
UA2 CONTEST CLUB	767,346
PENZA	653,221
RK0BWW TEAM	557,094
IVANOVO`S DX CLUB	540,850
DAUBERVILLE DX ASSOCIATION	497,635
EASTERN IOWA DX ASSOCIATION	432,564
UDXC	405,793
WEST PARK RADIOPS	376,920
ORARI	370,160
BERGEN AMATEUR RADIO ASSN.	358,550
THAILAND DX ASSOCIATION - HSDXA	334,692
SAMOTLOR	308,565
OMSK OBLAST RADIOCLUB	253,164
ADXC	232,506
NORTHERN ARIZONA DX ASSN	217,835
SK6AW	159,643
WESTERN NY DX ASSOCIATION	131,814
VLADIMIR RADIO CLUB	118,359
NORTHERN NEW YORK CONTEST CLUB	57,441

com> and <cw@cqwpx.com>. Any correspondence may be sent to <k6aw@cqwpx.com>. See you in the contest!

73, Steve, K6AW

QRM

This contest operation was the last stop before going back to the U.S. after six weeks travel. I was on the air in New Zealand as ZL/S52NC/p, as VK6CN/P on Rottnest Island in Australia, VK6CN/4 on Great Keppel Island, and 3D2NC in Fiji. . . . **3D2NC**. Loved the ever-increasing speed. Toasted and roasted one of our linears. . . . **4D1Q**. Not too bad a score for a vertical antenna only. MFJ-1798; must try to get a beam up for next year. . . . **5B4AHA**. Just worked WAC by C8A, my first AF. Yeah! Am JA's 3rd class licensed, only 10W output and using whip ant, up abt 13m, tnx 4 ur works, 73. . . . **7K2PBB**. Fun contest as usual, but very few DX coming through up here at 64 degrees north. I worked 66% Europeans and I thought I would be able to work 50% DX. But I will make another try next year. . . .**7S2E**. It is really good to be in WPX contest. It was new experience for me as 40m single band, and I hope I got the new Asia record. . . . **9K9X**. Bands were terrible. We managed to work a few. Many people confused us with RL1G, telling us that they had already worked AL1G when in fact it wasn't us. . . . .**AL1G**. Another enjoyable contest, this time from Mozambique. Thanks to my host Silvano, C91A, for using his equipment, contest callsign, and hospitality. . . .**C8A.**

Condx is bad, competition hard, thank you very much to everyone who give me call. Pleasure to work Steve, N8BJQ. . . . **D4B**. After many years of heavy QRL I am now retired and enjoyed getting my feet wet again in the WPX contest, which is a marvelous event. Next year I will be a more serious contestant. . . .**DJ3WE**. In a few years we will dream of having conditions like in WPX CW 2003. . . . **DL2OBF**. Conditions not too good and I was lazy this time with only 22 hours on. Lots of ZL's and VK's this time. . . . **DL6RAI**. Active geomagnetic conditions make contesting extremely difficult in this part of the world, and the beginning polar night kept openings on the higher bands to an absolute minimum. Thanks a lot to everyone with sharp ears who listened out for my weak signal. . . . **DP1POL**. Condx not the best but I was happy with my results from QRP and low doublet antenna with limited operating time. Rig TS-940s with external ALC control. . . . **G2HLU**.

Decline in sun-spots took its toll on 10m with nothing worked in the U.S., barely anything in the Caribbean, and just a handful of the South American regulars. The numerous unusual prefixes always make CQ WPX CW a great contest. QRV just under 36 hours. . . .**G3TXF**. I had lots of QRP fun in this event. It was my first QRP entry in WPX, and I am grateful to those who took the trouble to listen for my signals. I was using an Elecraft K2 at 5 watts output, and the only antenna used was an inverted Vee doublet. . . . **GW4ALG.** After 20+ years of contesting I discovered QRP; what a blast!. . . . **HB9DSU**. Good conditions to Europe, but not so good to North America. . . . **HL1/ WX8C**. Despite

CQ WW WPX CW CONTEST
ALL-TIME RECORDS

The contest is held each year on the last full weekend of May. The All-Time Records are updated and published annually. Data shown below is: callsign, year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS
Single Operator

1.8	IH9/OL5Y('98)	341,068	182
3.5	TA0/Z33F ('02)	1,452,522	348
7.0	LU1IV('97)	7,671,456	702
14	EA9LZ('98)	5,708,498	758
21	A45XR('99)	6,557,697	843
28	ZX5J('02)	6,787,440	857
AB	P40W('94)	14,168,115	845

Multi-Operator Single Transmitter

P49V('01)		19,760,774	1034

Multi-Operator Two Transmitters

HC8N('03)		54,697,072	1189

Multi-Operator Multi-Transmitter

HC8N('99)		54,697,072	1264

U.S.A. RECORD HOLDERS
Single Operator

1.8	K1ZM('95)	40,446	107
3.5	K1ZM('93)	406,080	288
7.0	KG1D('03)	2,999,854	617
14	K2VV('01)	3,523,488	762
21	NU5A('99)	4,411,299	789
28	WW4M('01)	2,547,046	674
AB	AJ1I('01)	8,213,226	849

Multi-Operator Single Transmitter

KM9P('01)		10,691,724	964

Multi-Operator Two Transmitters

KM4M('03)		12,395,116	1019

Multi-Operator Multi-Transmitter

KM3T('01)		21,103,320	1110

CLUB RECORD
Northern Calif. Contest Club('02).....253,543,497

WPX (Prefix) RECORD
HC8N('01).....1299

QRP/p RECORD
P40W('97).....4,018,208

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	IH9/OL5Y('98)	341,068	182
3.5	EA8/OH2KI('96)	1,358,852	347
7.0	EA9AZ('01)	4,212,447	547
14	EA9LZ('98)	5,708,498	758
21	5X1Z('01)	6,362,352	782
28	ZS4TX('01)	4,602,028	722
AB	D4B('03)	15,185,170	962

ASIA

1.8	4X4NJ('96)	259,420	170
3.5	TA0/Z33F('02)	1,452,552	348
7.0	TA3/G3AB('03)	4,266,512	571
14	4Z6DX('91)	4,614,030	743
21	A45XR('99)	6,557,697	843
28	HZ1AB('02)	3,669,994	659
AB	P3A('01)	10,723,620	870

EUROPE

1.8	SP5GRM('97)	249,516	261
3.5	LY2BTA('96)	967,974	399
7.0	UA6LAM('96)	3,760,164	701
14	CT2A('95)	4,231,598	826
21	9H0A('02)	5,389,008	933
28	9H0A('01)	3,965,315	841
AB	OH0Z('00)	7,240,444	893

NORTH AMERICA

1.8	VA1A('99)	103,680	120
3.5	FM5BH('97)	833,490	315
7.0	V26BA('97)	6,227,550	659
14	FM5BH('98)	4,642,866	762
21	ZF1A('99)	5,330,129	799
28	FM5GU('01)	2,849,769	621
AB	WP2Z('99)	12,506,280	890

OCEANIA

1.8	KX6DC('88)	12,240	45
3.5	KX6DC('89)	258,258	143
7.0	ZM1A('98)	5,144,480	592
14	KH6ND('03)	4,126,690	730
21	KH6ND('99)	6,107,256	813
28	KH6ND('00)	1,523,008	424
AB	KH6ND('02)	7,996,774	862

SOUTH AMERICA

1.8	YV1OB('86)	11,550	35
3.5	YX3A('89)	1,004,060	305
7.0	LU1IV('97)	7,671,456	702
14	YW1A('91)	4,617,456	732
21	PU3A('02)	5,746,284	813
28	ZX5J('02)	6,787,440	857
AB	P40W('94)	14,168,115	845

MULTI-OPERATOR SINGLE TRANSMITTER

AF	3V8BB('02)	19,041,135	1065
AS	P3A('02)	18,176,342	1046
EU	9A7A('01)	10,915,020	1044
NA	8P4A('02)	18,516,960	1056
OC	AH2R('01)	11,541,420	957
SA	P49V('01)	19,760,744	1034

MULTI-OPERATOR TWO TRANSMITTERS

AF	No Entry		
AS	RT9W ('03)	12,006,568	872
EU	R300SP ('03)	12,793,452	1054
NA	KM4M ('03)	12,395,116	1019
OC	ZL6QH ('03)	12,029,472	884
SA	HC8N ('03)	30,928,268	1187

MULTI-OPERATOR MULTI-TRANSMITTER

AF	6V6U('97)	9,938,896	758
AS	A61AJ('02)	42,766,232	1244
EU	4O0A('00)	20,932,902	1143
NA	6Y2A('02)	38,821,328	1274
OC	KH7R('97)	11,760,354	822
SA	HC8N('99)	54,697,072	1264

QRPp

AF	5Y4FO('92)	649,057	311
AS	ZC4BS('02)	2,515,388	521
EU	LY5A('01)	2,331,414	646
NA	TI5X('01)	2,568,470	615
OC	FO8JP('86)	572,131	259
SA	P40W('97)	4,018,208	632

JE1SPY with his balcony antenna set up for a single-band 160 meter WPX contest entry.

Great conditions on Saturday afternoon! I couldn't believe how high the QSO numbers were when I finally got on a few hours into the test (or how high some were at the end!). Thanks to all those great DX ops who pulled my QRP signal out of the soup. . . .**KX7L**.

Great fun. Managed QRP 40m WAC during the contest, tks to all involved. . . . **M0O**. Thanks to VE1JF for letting me use his fine station and special callsign (VC1R). Much more fun than operating from California!. . . **VC1R**. Conditions got better as the contest went on and were pretty good by the end. . . .**WO8CC**. Farewell sunspots; see you in a few years. . . .**WR3O**. First time in WPX CQ competition due to other commitments. Thoroughly enjoyed what operating I could manage. Will definitely make a note in my diary for next years. Conditions not brilliant, although 28 MHz opened for a brief spell on the Sunday afternoon. . . . **ZC4VG**. This was our first MS from ZF. Conditions were better than we expected, although not real good. We had trouble raising anyone on 80m even though the band seemed to be open. As always, thanks to Andrew and the gang at the CARS for the hospitality. . . . **ZF1A**. Great first CW WPX even if conditions were not that great here in South Africa! After first few hours I was starting to wonder how wise it was to run QRP with the current state of the solar cycle. . . . **ZS6DX**.

(Continued on page 108)

the not-so-good condx from the northern Japan, we enjoyed both contesting and BBQing for three times! I guess they were satisfied with it!! (The "it" means BBQ, hi). . . . **JA8RWU**. Tnx contest; first time ever worked a CW-only contest. . . . **K0HW**. Great contest sure does wonders for the code speed. See you next year. . . . **K3EGE**. My highest WPX score. The bar has been raised. . . . **K3NK**.

Running a single band was great. Was busy during the day with the family, radio at night. . . . .**K4SV**. It was not difficult to find a clear frequency on 10 meters :-). Hoped to pick up a new country or two on 80m. Total 80m Q = 4, all NA, nice opening to EU Saturday night on 20m. . . . **K6GT**. The goal this year was to put up new Oceania 20m high power records on both modes. Looks like mission accomplished! . . . **KH6ND**. If Mars had life I think I could have raised my QSO total, cause in these condx I certainly don't think had a signal bouncing back to Earth as often as would have liked! . . . **KS7T**.

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How do you match up the functions of Yaesu's automatic antenna control system with non-Yaesu antennas, such as motorized mobile "screwdrivers"? W4RT Electronics has built an answer.

CQ Reviews:

W4RT Antenna Boss for Yaesu Radios

BY GORDON WEST,* WB6NOA

When Yaesu introduced its compact, mobile, FT-100 HF/VHF/ UHF transceiver a few years ago, a companion automatic mobile antenna system, the ATAS-100, also debuted as an accessory. At first hams seemed puzzled by the rubber bellows on the antenna and were not quite sure exactly how it might work. Well, it worked great! Today the ATAS-100 and/or its successor, the ATAS-120, pair up with a variety of Yaesu mobile radios, including the newer model FT-100D, and the FT-847, FT-897, and FT-857. However, some of the system's unique features make it difficult for hams to take full advantage of them if they choose to use other motorized mobile antennas. For example, power for the ATAS-100/120 runs through the coax cable, the antenna mounts on an SO-239 connector rather than the more common 3/8-24 threaded mount, and the system's "brains," which remember settings for the automatic tune function, are in the radios, not the antennas.

W4RT Electronics has come up with a solution for Yaesu owners who would rather use an antenna from High Sierra, Hi-Q, or Tarheel; they specialize in motorized mobile antennas. The new "Antenna Boss" offers users of these antennas the ability to use all of the features of the ATAS system, including one-button automatic tuning.

"The Antenna Boss with the Yaesu radio is a hybrid of analog logic comparators and a digital state machine—a bit of pure analog and a solid-state motor controller," explains W4RT's Barry Johnson, W4WB, adding, "Even though the ATAS control circuitry inside the radio may appear simple, there are some undocumented peculiarities regarding how the ATAS functions, and there are subtle differences among how each model of Yaesu mobile radio tunes the ATAS-100/120 antennas." Bob Koeber, N4BK, worked with Johnson in the design of this new antenna-controller product.

The Antenna Boss from W4RT Electronics allows owners of certain Yaesu mobile rigs to take full advantage of Yaesu's ATAS automatic antenna tuning system even if they don't use one of Yaesu's motorized antennas.

Black-Box Magic

The Antenna Boss is a black plastic box that mounts anywhere with a DB-9 cable package containing red and black DC power wires that go to the motor leads on the non-Yaesu antennas, a pre-made interface cable consisting of a mini-DIN plug that plugs into the Yaesu radio for Boss and antenna power, and a 4-pin Molex plug that can be used to connect a manual control switch and the W4RT One Touch Tune module.

Inside the plastic box are the controller electronics plus eight DIP switches that need to be pre-set for motor stop current with dynamic braking and motor voltage. The stop current is factory set for 700 milliamps, and the motor voltage is factory set for 12 volts DC output to drive the High Sierra, Hi-Q, and Tarheel antennas. You will need a short coax jumper to go from the Yaesu radio's HF antenna connector to the SO-239 coax connector marked "radio" on the Antenna Boss.

*CQ Contributing Editor, 2414 College Dr., Costa Mesa, CA 92626
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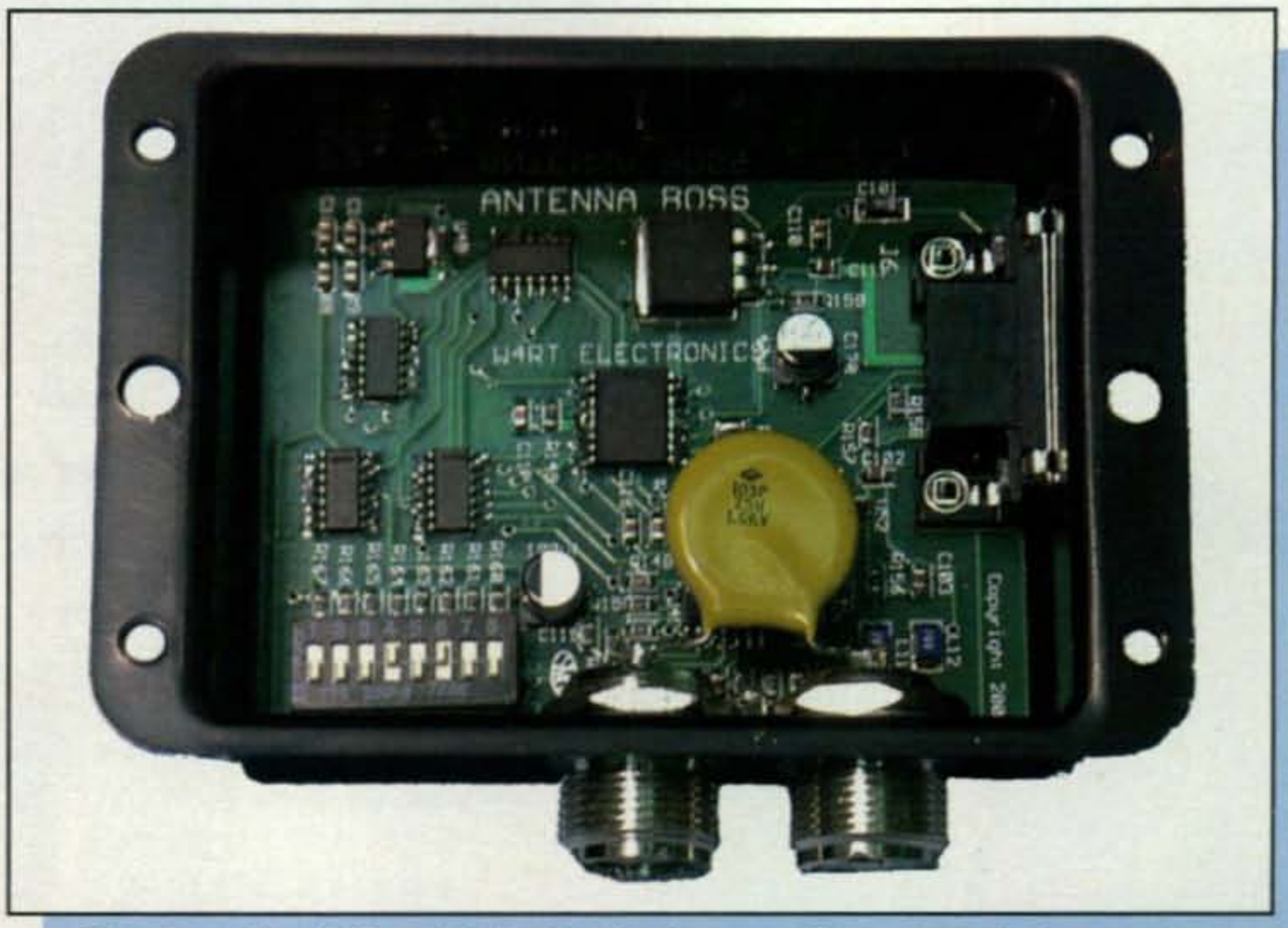


The 8-position DIP switch inside the Antenna Boss controls the maximum antenna motor current. It is preset for 700 milliamps, which will operate most current-model motorized antennas.

You then connect your antenna's feedline to the SO-239 connector on the Antenna Boss marked "antenna."

Once you have everything hooked up, two additional pages of detailed instructions give you a technical overview and understanding of how the Yaesu ATAS control system operates. There is a detailed page of initiating automatic tuning operation, or manual tuning operation with the Antenna Boss.

You can go into the automatic tune mode by pushing the Yaesu's tune button, or in the manual mode, you might select the W4RT One Touch Tune auxiliary switch, which when activated sends appropriate commands to the radio. This manual mode is included primarily to allow operation on the bands below 40 meters that the three aftermarket antenna products offer, including the 5-MHz (60-meter) and 3.8-MHz (75-meter) bands. Hi-Q even makes a monster coil that can get you all the way down to 160 meters in the manual tune mode, too!

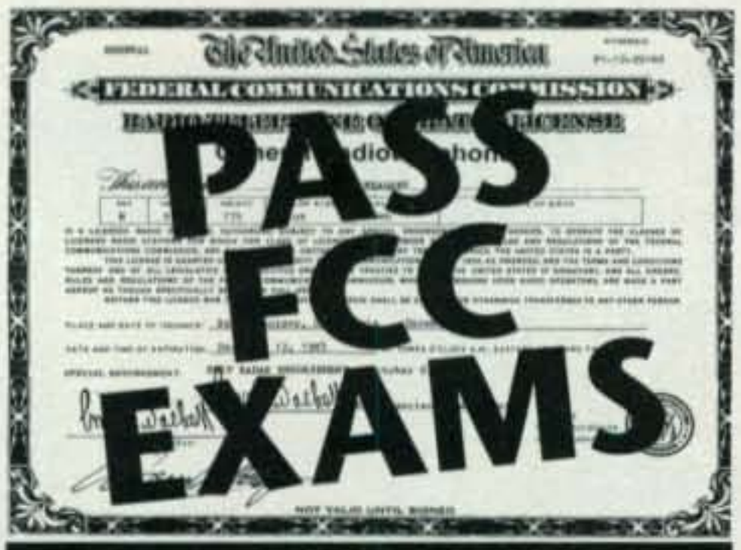
"The Boss decodes the command signals from the radio, determines which way the motor is to run, provides power to the motor, monitors the start-up or on-rushing current drawn by the motor, monitors the running current of the motor, and performs dynamic braking of the motor as motor stall is detected," adds Johnson. "The Yaesu radio circuitry monitors the VSWR and determines when to stop the antenna. When the radio detects a dip in the VSWR below 2:1, it sends a message to the antenna to stop.

New Features on Newer Rigs

I discovered that the recently introduced Yaesu FT-857 and FT-897 transceivers include a couple of new features in their ATAS functions. The first is the tuning now begins with a sequence of ten short jogs of the antenna for fine tuning, and then it starts the normal continuous running of the motor. This is an excellent improvement for those who QSY to a nearby frequency, rather than changing bands. The second improvement I detected was that the radio now remembers the tuning frequency when you perform manual tuning through the radio, and the VSWR at match is less than 2:1. This allows much faster tuning and returning to the automatic ATAS mode.

We tried the Antenna Boss with antennas from each of the motorized antenna manufacturers, and they all worked great. We also tried their larger models, and except for needing to switch to a higher current rating, each of the antennas we tuned was faithfully controlled by the W4RT Antenna Boss system.

The big advantage of spending extra money for the Antenna Boss when this



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type of circuitry is already built into the Yaesu ATAS antenna systems is the ability to screw on a much larger mobile HF antenna and use some of that neat circuitry already built into the Yaesu transceiver. It also allows you to add a variety of top-loading capacity-hat systems to improve radiation performance, and the radio and the Antenna Boss will detect that big hat and decrease the number of coil turns necessary for resonance. The only disadvantage is a small set of red and black wires that you must now route in with the coax cable. A separate 12-volt line is required to run the after-market antenna motor. The Antenna Boss itself is powered by the radio.

The Antenna Mate

Current antenna models from High Sierra, Hi-Q, and Tarheel use power-efficient, high-quality motors that draw 500 milliamps or less while running. However, there are a lot of older motorized antennas around that may use a higher current motor that might not be compatible with the Antenna Boss. To provide hams with these higher current motorized antennas the opportunity of using the Antenna Boss, W4RT Electronics has also developed the Antenna Mate. The Antenna Mate plugs into the DIN connector of the Antenna Boss, and the DIN cable package then plugs into the Antenna Mate. The only difference is that the supply power must come from your Yaesu 12-volt lead in. The antenna motor current can now be as much as 5 amps! However, be careful, as Antenna Boss in the high-current mode cannot monitor motor current when the Mate is used. However, most older and larger antenna motors have some sort of stall network that opens the connection if too much current is pulled continuously.

Finally, W4RT Electronics was just a phone call away for some of the questions I had during our initial tests. They were able to get me easily through the initial turn-on stage where your antenna system needs to know which way to go to get in proper sync with the Yaesu radio. We tried several different Yaesu radios with the Boss and our different antennas, and they all worked well.

The Antenna Boss retails for $179. For technical details, go to <www.w4rt.com>, or if you have questions, e-mail <boss@w4rt.com>. The folks at W4RT Electronics are eager for additional input on how you have put their system to work as part of your mobile or home-base antenna system. ■

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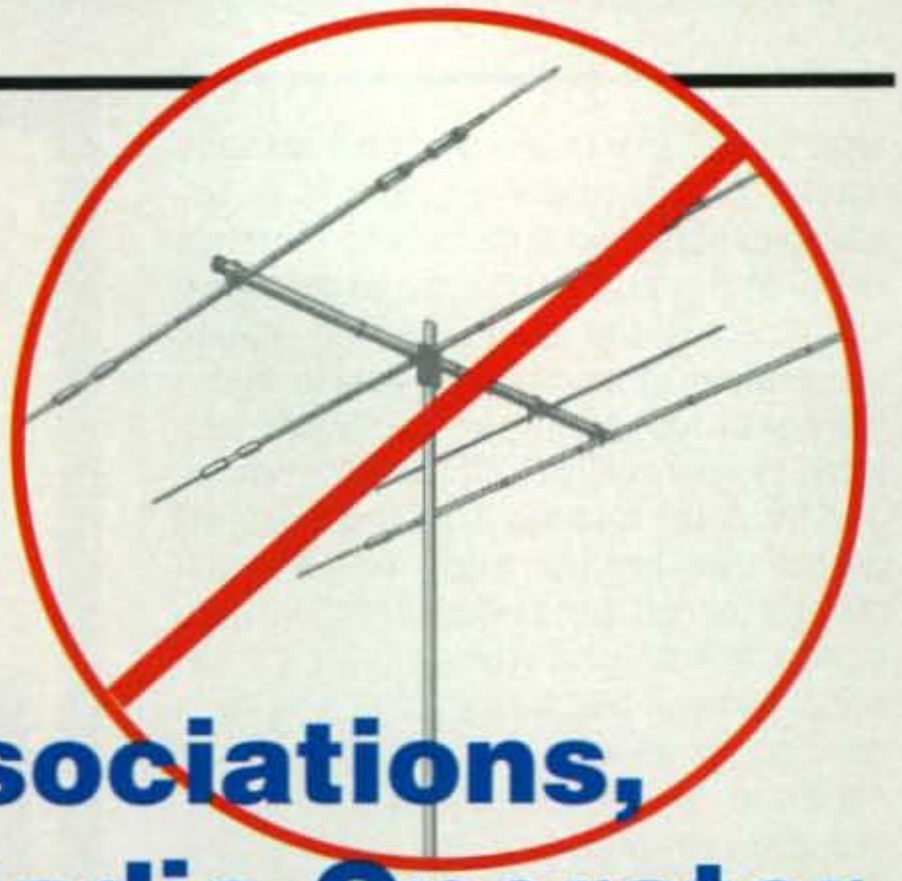
The reach and power of home owners' associations is growing rapidly. If you live in an HOA-controlled neighborhood, says National Antenna Consortium President KGØKI, you may have even fewer rights than you think.



Home Owners Associations, Covenants, and the Radio Operator

Part I: The Truth About Today's HOAs

BY FRED BAUMGARTNER,* KGØKI

Recently I had the opportunity to work with three hams who believed themselves well-informed and safe from home owners' associations (HOAs), but instead found themselves with HOA battles on their hands. The concept of "rules I can live with" on the part of the HOA is something that needs to be looked at ever more closely. Unfortunately, too, the stock of available housing that is not under HOA control is dwindling and in some areas simply no longer exists. There are a lot of excellent books and articles on the subject of the challenges of erecting an antenna in a covenant-controlled environment (not the least of which is Fred Hopengarten, K1VR's excellent book[1]), plus local advice available through the ARRL, volunteer legal counsel, and others. Nonetheless, there is a need to revisit the rapid growth of the HOA movement, the increasing prohibitions HOAs impose, their growing power, and the impact this has on hams.

Clearly, HOAs are becoming more powerful and better organized, and are almost universally opposed to antennas, and amateur radio antennas in particular. HOAs that were once neighborhood groups limited to neighbors interacting with one another have spawned a whole series of support organizations and lucrative legal practices that focus on HOA actions.

HOAs acting nationally through umbrella organizations are not to be dismissed lightly. For evidence, I point to the Telecommunications Act of 1996. A portion of the act provides a preemption of HOA authority over TV and small satellite antennas, and provided an inexpensive means of resolving disputes through FCC administrative review of a particular situation. The so-called OTARD (Over The Air Receiving Devices) rules *should* have provided universal relief from HOA bans on TV antennas. Initially, the FCC published a guideline in which a TV antenna on a mast up to 12 feet above the roofline was more or less a given right. HOAs responded with intense pressure, and now the practical reality is that only the proven minimum usable antenna is permitted. That burden of proof largely is placed upon the resident. Unless you can prove otherwise, an attic antenna or rabbit ears may be all the accommodation allowed for you to see adequate TV pictures from stations for which you are in the Grade-A contour (primary service area).

Amateurs once looked longingly at the OTARD rules, as in covenant-controlled communities a 12-foot TV-like antenna is infinitely more than an amateur typically is permitted. In practice, the OTARD rules have eroded to the point where Grade-B reception and even digital TV are not something that the FCC will protect as a given. The reason is simple and practical. In the beginning, the FCC could apply pressure on an HOA to be "reasonable," and a compromise usually was reached with a few phone calls. Today, HOAs with national support have the resources to file engineering and legal roadblocks which the FCC's informal mediation process is simply unequipped to handle.

A Threat Beyond Ham Antennas

HOAs are also a major force in battling broadcast, commercial, cellular, and even public-safety radio towers. In Denver, HOAs under "CARE" (Canyon Area Residents for the Environment), a local umbrella organization, have effectively halted the Digital-TV roll out and forced television stations to launch their DTV programming on poor antennas (one is mounted on the top of the studio building in the downtown "valley") at low power by preventing the construction of a DTV tower on the mountain on which the current analog stations operate. In another case, in the suburb of Highland's Ranch, Colorado all 12.54 square kilometers and 73,960 homes are 100% covenant controlled. Here the HOAs fought a short two-way radio tower for a neighborhood fire station and *won*. These actions and others clearly suggest that HOAs have had significant and increasing impact on the FCC, and the FCC is very shy about overriding HOAs without specific Congressional orders to do so.

It should also be obvious that HOAs represent significant potential voting power. It is very conceivable that HOAs will continue to organize and drive their agendas through Congress on the shoulders of the votes HOAs potentially represent.

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I think it is safe to say that many, if not most, hams do not appreciate the strength of HOAs when it comes to antenna regulation, or the rapidly increasing amount of property restricted by covenant. Here are four things about HOAs and towers you may think you know that might be wrong:

First (and most dangerous): Many an amateur has reviewed covenants, and even had covenants reviewed by legal professionals who conclude that if the covenants don't include *specific antenna prohibitions*, they do not exist. How often do we hear, "I've read the covenants and they don't say a thing about antennas?" The national HOA organizations all promote clear antenna prohibitions, up to the limits provided by the FCC, so most contemporary (1997 on) covenants include clear antenna prohibitions. Most refer specifically to prohibiting any and all antennas not specifically provided for under the OTARD rules we discussed earlier in this article. On the other hand, covenants written prior to 1997 (and even some after) are not likely to mention antennas. One of the hopefully unintended consequences of the OTARD rules is that they have set the standard for antenna acceptance, and they did *not* include amateur antennas. Had there been no Telecom Act of 1996, there would be far fewer covenants with bans on "all non-OTARD antennas." Had the OTARD rules included amateur radio . . . things would be very different today.

Here's the loophole: Even those covenants that don't have specific rules for antennas almost always have an approval process for *structures and improvements*. Not all that long ago, structures were buildings in the classic sense, and improvements involved moving dirt, paving, and the like. Any HOA attorney will argue that in a covenant community, the meaning of structures and improvements *now covers everything* from painting a home, to repairing a roof, changing fixtures, and even mailboxes and plantings; and thus the HOA approval authority extends to all of these items, *especially unusual and unsightly items such as antennas*. I am unaware of any recent case in which an amateur antenna has not been considered a structure or improvement, and therefore subject to HOA approval. Likewise the argument that other antennas and improvements exist, even those which clearly violate covenant restrictions, is unlikely to convince a court that you are entitled to violate the covenants by bypassing the approval process. HOAs are generally granted

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The National Antenna Consortium

Three years ago the National Antenna Consortium was formed to seek fair and reasonable tower and antenna regulation on a national level for all users. The theory was to convince Congress to grant, as a package, a certain unconditional minimum right to an antenna or tower tied to an FCC license, and a means of seeking more than the minimum with a process that had real quantifiable standards and was fast and affordable.

If the NAC is successful, there will be a unified policy which simply says that for such a license, and in such a location, this is the minimum installation provided for and permitted without question, and given a prescribed set of conditions and process, that right can be extended.

The NAC maintains a website at <http://www.antenna-consortium.org> and we invite you to visit.

great leeway in selecting which covenants they enforce and to what degree. As the elected representatives of the community, it is assumed the HOA members represent the will of the community. *By purchasing the house, it is assumed you agree to live under HOA supervision and have granted them full authority to determine what they will and will not approve.*

On the other side of the coin, most covenants require that applications be reasonably approved. Many hams underestimate how difficult a task it is to prove that an antenna is a "reasonable" structure or improvement.

Let's look at the gauntlet up to now. You and your attorney look over the covenants and see that there are no specific antenna regulations; certainly the covenants in context talk of approval of structures and improvements, and an antenna is an *accessory by use*, and in any case, the HOA will have to prove that a denial was reasonable if your request is turned down.

You now submit your application. Hams tend to have an optimistic view of the tolerance of their neighbors. What is a 45-foot antenna on a 5-acre plot or a vertical in the bushes? The HOA umbrella organizations are very clear on this one: Amateur antennas decrease the value of the neighborhood, upset the architectural harmony, and present a radiation danger and interference hazard to expensive and delicate consumer electronics. The legal firms that serve HOAs also know that antenna cases are complex, time intensive, and thus very lucrative. Further, small groups of people are completely and absolutely antenna-intolerant. Once news of your application is out, odds are that one-out-of-fifty or more residents will be extraordinarily opposed. The sheer passion of the few antenna-phobic residents will take any number of uncommitted residents and add them to the opposition. Talk of government regulation of RF radiation (showing that even the government knows that radio waves are hazardous, according the HOAs), difficulty selling a house anywhere within sight of an antenna, and even character assassination are all tools the zealous antenna-phobe can and will use, and almost always the elected HOA members will agree. An amateur is almost always alone defending against pseudoscience and fear.

Bottom-line: It is the rare HOA that will approve any antenna. I've certainly heard of a number of hams who moved into a community, threw parties, made friends, and felt secure in making an antenna application only to find that they had no support from their neighbors. It is certainly the rare situation these days in which an amateur can move into a community and convince the neighbors to approve an antenna. Ten years ago or more, the situation might have been very different.

The dynamics of this situation are obvious. Passionate people with an agenda to create a beautiful and harmonious neighborhood seek and get elected to HOAs. People who believe in tolerance and "live and let live" *do not run* and do not get elected. *The entire HOA movement is driven by the desire to increase restrictions and controls, and places that power in the hands of those most interested in doing such.*

Second: Covenants are not unchanging. HOAs that have approval authority often have "unrecorded architectural guidelines." You may not know they exist, you probably will not get a copy when you buy the house (they are guidelines, after all, and not covenants), and they can be created or modified without notice at the discretion of the HOA. It is not uncommon for a ham to get a letter from the HOA notifying him that he has made an improvement without approval and that the improvement is in violation of the architectural guidelines. Sometimes the ink is still wet on the guidelines, and at no time did the HOA publish its plan to change the guidelines.

Colorado has an even more aggressive state law known as CIOA, or the

Common Interest Ownership Act. The genesis of the law comes from the 1980s, when many condo communities went bankrupt and their HOAs expired without renewal. When the economy turned down, there needed to be a way to create an HOA for communities with common interests for continued maintenance of common areas and assets. Originally the intent clearly was to take care of common roofs, walls, community centers, parking, and the like. With time, though, and a series of court decisions, any community that shared any "common area" — road, frontage, drainage, signs, etc. — was found to be subject to the CIOA. In this case, a neighborhood with expired or no covenants at all can elect with a simple majority to create and enforce covenants under an HOA. Further, the COIA provides a means by which the elected members of the HOA can change the covenants at will, without a community vote or even public notice. Many hams assume that because there is no HOA, there can be no HOA. In Colorado, at least, that often is not true. Even homes on fairly large tracts of land (up to 35 acres in Colorado) may have some common interest that triggers the CIOA.

Many hams also assume that covenants are difficult to change. In reality, depending on the state laws and original covenant language, this may be very untrue. It is not uncommon to see a series of amendments and even entirely new covenants recorded on any deed under covenant control.

Third: Litigation is an option. It is very unlikely that an HOA will agree to mediation or a process that might lead to a compromise. The reason is simple: HOA litigation is most often successful, law firms that specialize in HOA litigation win often enough that they can take cases on contingency, and HOAs spend community funds, not individual funds. Nearly all covenants provide that the loser pay the winner's legal expenses. Hams assume that the process is fairly fast and reasonably affordable. Wrong. In reality, once an HOA begins litigation, the game is to expend as much of your time and money as possible. Busy courts tend to want to dismiss these cases with as little effort as possible, but they are complicated enough that several hearings normally are required. This can be real money. Judges are likely to send the lawyers back to write a brief to explain some portions of the case. Together, the trip into court and the legal time to research and write the briefs comes to around $5000. Recalling that the loser is going to pay all the legal bills, and the HOA is well financed, the HOA lawyer who can come in with a confused case is already winning.

Fourth: HOAs play fair. Few covenants require that HOAs publish their minutes or actions, or even report their financial or litigation status to the neighborhood. If you are expecting a neighborhood reaction to come to your defense, forget it. It is more common that the neighbors will never even know what the HOA is up to. It is common for an HOA to decide against a resident, without the resident even knowing they are meeting on the subject! Many HOAs have an open meeting policy (they don't have to), but subtly or not so subtly discourage attendance. Some hold an informal "after meeting," where the real voting occurs. Likewise, there are no standards of judgment. Reasonable is whatever the HOA decides reasonable is. Behavior and practices that would place any governmental body under suspicion are quite acceptable in most HOAs.

And so? The practical effects of an HOA on amateur radio might vary widely, and certainly the amount of covenant-controlled housing varies from a minimum in the older urban population centers and unpopulated rural lands, to virtually 100% of recent suburbia. Nonetheless, clearly the trend is to expand the HOAs' "government within the government" power and area of control. Outside of fair housing regulations and the limited OTARD preemption of the Telecom Act of 1996, there are few regulations on HOAs. Unlike when PRB-1[2] was enacted, today the threat to amateur radio comes not so much from the local government, but from the neighborhood HOA. Non-HOA controlled land arguably is selling at a premium and often is land that demands commutes and additional support services that otherwise would not be good personal or public policy (consider the number of hams with long commutes to get to their non-HOA property). Other non-HOA properties are older, urban, and may not fit with an amateur's other goals. Without limits, HOAs will make an amateur choose between amateur radio and appropriate housing. In an era in which emergency communications may become very important, one must ask if the HOA movement hasn't made a de facto policy decision that isn't in America's best interest.

Part II

In the conclusion of this article we'll look at the brighter side of things and discuss ways you might be able to live with your HOA and still get on the air.

Notes

1. Hopengarten, Fred, K1VR, *Antenna Zoning for the Radio Amateur*, ARRL, Newington, CT, 2001.

2. PRB-1 is the FCC's 1985 ruling that provided *limited federal pre-emption* of state and local regulation of amateur radio antennas. It specifically did not apply to covenants and home owners' associations, and in recent years the FCC has rejected a request by the ARRL to include HOA covenants in its coverage. ■

Resources

The following websites might be of interest:

<http://www.caionline.org/> is the site for the Community Associations Institute, an umbrella group for HOAs. On the other side of the coin, the American Homeowners Resource Center at <http://www.ahrc.com> voices opposition to the HOA movement. The FCC's OTARD rules (47 CFR 1.4000 Media Bureau) are also of interest, and can be found at <http://www.fcc.gov/mb/facts/otard.html>. Also, the National Antenna Consortium maintains a website at <http://www.antenna-consortium.org>.

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Irwin Math's notes

BY IRWIN MATH,* WA2NDM

Power Supplies

Since everything one builds requires a power supply of one form or another, when something interesting in this area comes up, we feel obligated to investigate. As a result, this month we would like to describe an interesting new line of isolated DC-to-DC converters from Texas Instruments. The DCP-01 series consists of a group of IC-size devices (14-pin DIP and surface-mount packages) that convert an input voltage of 5, 15, or 24 volts (separate units) to an isolated output of 5, 12, or 15 volts single-ended, or ±5, ±12, or ±15 volts dual. All have a power rating of 1 watt. These units are fully self-contained and do not require more than the simple circuit of fig. 1 to operate. We will discuss the unique function of the sync pins shortly.

Fig. 2 is a diagram representative of the workings of the chip. You will see that there is an oscillator (about 800 kHz) that is divided by two to produce a 400-kHz signal which is then used to drive a tiny toroid transformer. The high frequency allows this transformer to be small enough to be fully contained within the chip and is what is responsible for the isolation. However, since the operating frequency is so high, there is a small amount of RF generated by the circuitry. When two such DC-to-DC converters are used on the same circuit board, beating between the two oscillators could result and produce beat notes that would interfere with whatever circuitry the converters are powering. To eliminate this potential problem, sync pins are provided to enable two or more converters to be connected to each other so the operating frequency is the same, preventing any possibility of beats. Fig. 3 shows how two converters would be connected to provide a ±15-volt output supply from a single-ended 5-volt source. Such a circuit would be use-

*c/o CQ magazine

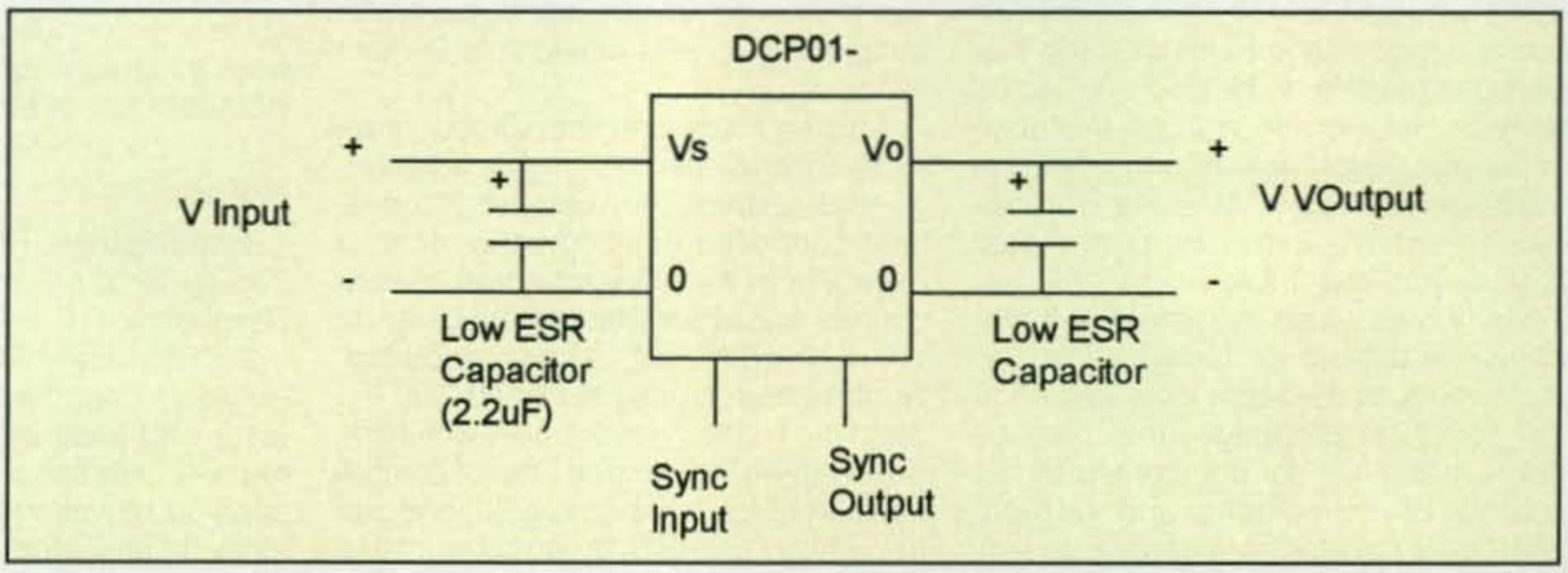

Fig. 1– A simple DC-to-DC converter using the DCP-01 series. Note that the input and output are fully isolated from one another.

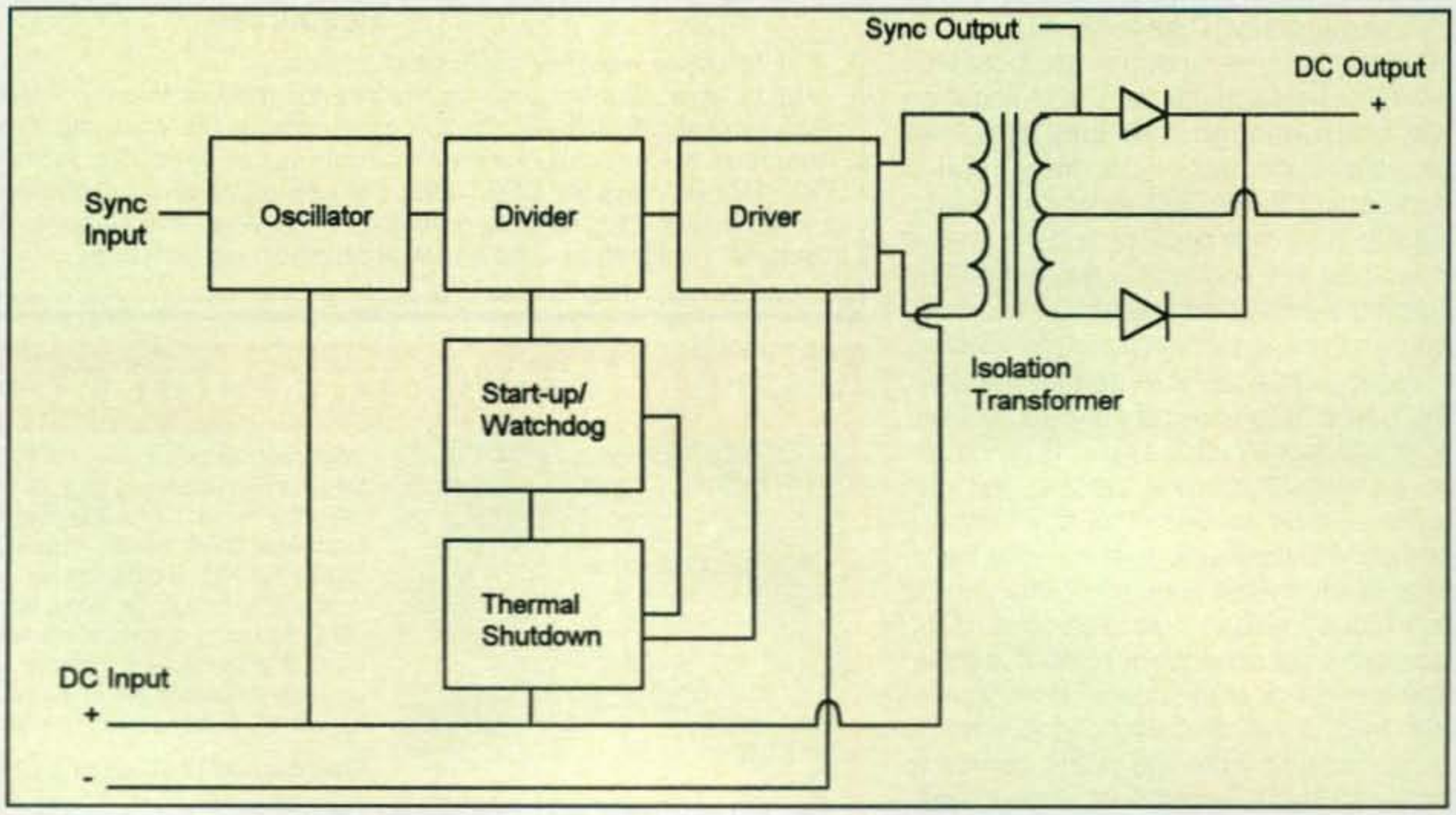

Fig. 2– Inner circuit of the DCP-01 series.

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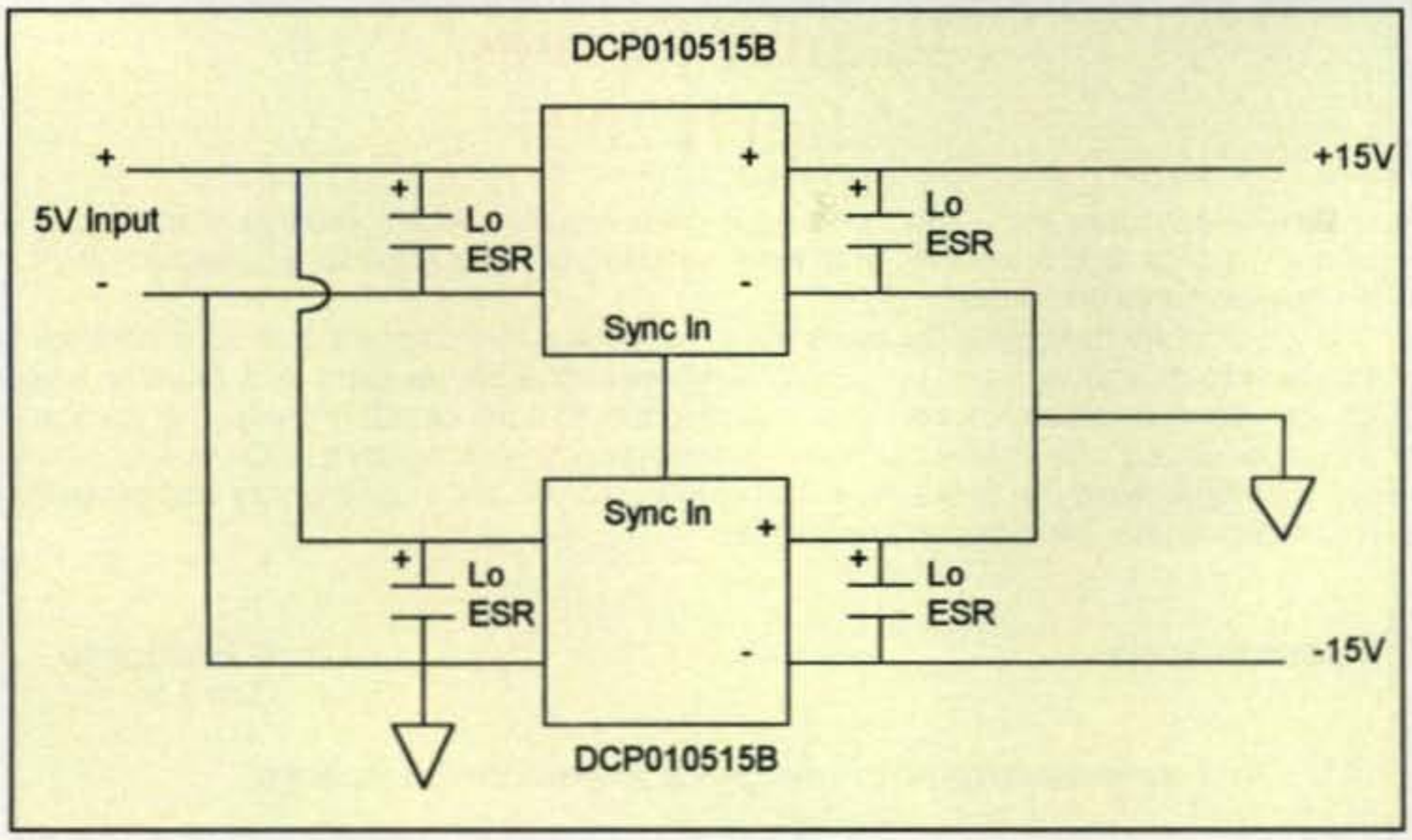

Fig. 3– Five-volt input to ±15-volt output supply.

ful for driving op-amps in an audio or instrumentation application.

You will note the inputs and outputs of the DC-to-DC converter circuits all call for low ESR (equivalent source resistance) filter capacitors. Since the converters are switching devices, the momentary peak currents drawn from the source supply can be high enough to sometimes cause start-up and running problems, especially with high current loads. Low ESR capacitors with values of 2.2 to 10 µF will prevent this problem. Such capacitors are available from all of the common parts suppliers. Just make sure the ones you choose are intended for use with switching supplies.

Finally, since the inputs and outputs are fully isolated, the DCP-01 series can be used to obtain high voltages by connecting them in series. Fig. 4 shows a single-ended 60-volt supply produced from two 5-volt to ±15-volt dual-output units. Note that all outputs are connected in series and that the sync pins are also connected to avoid beat products. You can ground either output lead as well if you wish. Still other converters can similarly be added for even higher output voltages.

At this point we should note that although we highlighted Texas Instruments this month, other manufacturers do have similar products. We think the sync feature is unique, however, as is the totally isolated DIP package. You will have to decide whether this is for you or if you need to search further.

Cost for the various versions ranges from $8 to $10 in single quantities and less for higher quantities. For further information, be sure to visit Texas Instrument's website at <www.ti.com>.

73, Irwin, WA2NDM

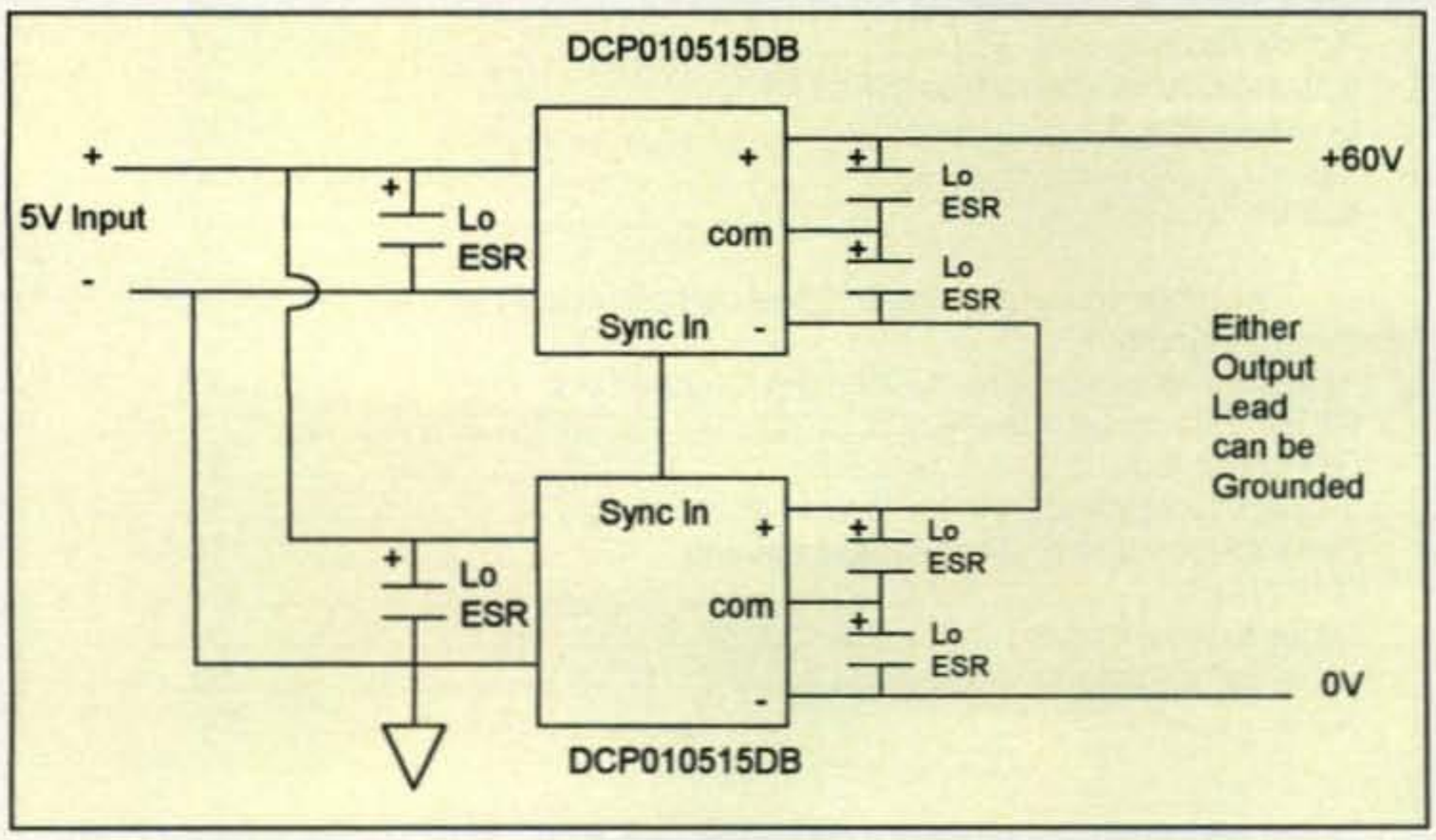

Fig. 4– Five-volt input to 60-volt output supply.

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What You've Told Us...

Our January survey asked about your QSLing practices, and it's fairly obvious that the old saying, "A QSL is the final courtesy of a QSO," no longer holds true for most of you. On the first question, 45% of you said you QSL only to stations whose cards you need, or who have QSLed you. Another 32% QSL only DX stations, while 23% say you QSL 100% —all contacts. In addition, 4% don't QSL at all.

On our next question, about why you exchange and collect QSLs, 54% of you said your main reason is credit toward operating awards, followed by 39% who want cards for a record of the people you've contacted, 9% "other," 5% to impress visitors, and 4% don't collect QSLs.

Next, we asked why you think it seems that fewer hams are exchanging QSLs. The most popular answer, at 42%, was "too little interest," followed by cost of postage (36%), and then a smattering each (3–5%) for cost of printing, too little time, talking only to people they already know, operating only on repeaters, and other.

In question 4, we asked about your participation in electronic/online QSLing and award credit programs. Two-thirds of you (67%) don't use any of the online programs, but 20% of you participate in the ARRL's new Logbook of the World program and another 20% use the online "eQSL.cc" program. About the same number (42%) agree that online/electronic QSLing is a cost-effective alternative to traditional QSLing, while 24% disagree, 26% aren't sure, and 8% don't care.

Finally, we asked about your use of the ARRL QSL bureau system (or equivalent in other countries)— 79% of you use the Incoming QSL Bureau and 68% of you use the Outgoing QSL Bureau.

This month's free subscription winner is Raymond Baker, N2DAY, of Depew, New York.

Reader Survey March 2004

We'd like to know more about you—about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the Survey Card and returning it to us. As a bit of an incentive, we'll pick one respondent each month and give that person a complimentary one-year subscription (or subscription extension) to *CQ*.

This month, we'd like to see how deeply involved you are in emergency and disaster preparedness, even beyond ham radio.

Please indicate... **Circle Response Card #**

1. ... are currently involved in emergency preparedness/response at any level (including club activities):
   - Yes....29
   - No....30

2. ... were previously involved in emergency preparedness/ response at any level (including club activities), but are not now:
   - Yes....31
   - No....32

3. ...are currently involved with emergency communications for any of the following groups:
   - Amateur Radio Emergency Service (ARES)/ARRL....33
   - American Red Cross....34
   - Military Affiliate Radio System (MARS)....35
   - Radio Amateur Civil Emergency Service (RACES)....36
   - Radio Emergency Associated Communications Teams (REACT)....37
   - Salvation Army Team Emergency Radio Network (SATERN)....38
   - Search-and-Rescue (SAR)....39
   - SKYWARN (National Weather Service)....40
   - Other....41
   - None....42

4. ... are involved with any of the following community or church-based groups:
   - American Red Cross (other than communications)....43
   - Community Emergency Response Team (CERT)....44
   - Citizen Corps....45
   - Local Emergency Planning Council (LEPC)....46
   - Police Auxiliary....47
   - Salvation Army (other than SATERN)....48
   - Southern Baptist Disaster Relief....49
   - Other....50
   - None....51

5. ... whether you are taking or have completed any of the following training:
   - ARRL Emergency Communications Course (any level)....52
   - CERT training (any level)....53
   - CPR/First Aid....54
   - Incident Command System (any level)....55
   - Organizational (e.g., Red Cross) training....56
   - SKYWARN....57
   - Other federal training....58
   - Other state/local training....59
   - None....60

Thank you for your responses. We'll be back with more questions next month.

Have you ever walked by a "boatanchor" at a flea market or hamfest and wondered, "Oh, if only that old rig could talk, what a story it could tell!"? Well, here's a story told by one of those old rigs. It's not quite "The Life of Reilly"; . . . It's more like . . .

The Life of Collins . . .

BY #4*

It's 1955, and today I saw God. I was powerless to speak to Him, of course, as I hadn't had my final alignment and I had no line voltage. But it was Him! My Creator, Sculptor . . . Art Collins himself. He walked by my production line today as they were installing my cabinet. I had just been born. My name is #4. I am a KWS-1! I am the world's most sophisticated amateur transmitter of 1955!

2003

That is my earliest memory. Now I have so many more memories, many happy ones and a few others that invoke wholesale terror. My life has been so full and rich with all the hopes and dreams, fears and doubts, that a long life provides. I am fortunate to have the opportunity to transmit this traffic to someone who can copy it, my ghost writer, PC. Sometimes my owner leaves me in standby while he eats dinner. I found a way to key my own VOX, thanks to a leaky Black Beauty capacitor. That's how I'm able to get on the air to transmit this story, via PSK31, to a PC in DL-land.

This is my autobiography, and I hope the rigs and the hams will appreciate it and remember me and my kind long after our filaments are dark and our keys have gone silent.

1955

It was the summer of 1955 when they crated me up in Cedar Rapids, Iowa and shipped me by truck to my first home. I was special ordered by Father Daniel Linehan, W1HWK.

**#4 is currently residing in the shack of Tony Brock-Fisher, K1KP. He (Tony, that is) can be reached at <k1kp@arrl.net>.*

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Father Daniel was a Jesuit priest who lived in Weston, Massachusetts, and of course he was a ham. Father Daniel was a very unusual priest, as he was also a geologist and went on expeditions to the North and South Poles, providing radio contact with the rest of the world. On one expedition he actually made a pole-to-pole QSO! While many of my brothers went into the military and worked for the Strategic Air Command, I was destined for a comfortable life in New England, where I would enjoy many sideband QSOs, sometimes working polar expeditions and often working DX. I was paired up with a beautiful sister 75A-4 receiver named #29. We were known as the Gold Dust Twins. Occasionally we would work DXpeditions, exchanging reports with other Twins from Cedar Rapids. Somehow they managed to travel by airplane and boat to faraway places, where they would make many thousands of contacts, running on generator power.

Life was good. Father Daniel was so excited to get us that he built a spacious new room onto his house as his shack. We were arranged side by side on a beautiful wooden desk, with a matching lighted speaker between us, just like in the old ham magazines, *QST* and *CQ*. All of his antennas carefully tuned for a low SWR. I never had to sweat my own power coming back in my face! I think Father Daniel even had an air conditioner in the shack just to keep us cool.

Some weekends one or two hams would come visit to watch us operate. They were intrigued with single sideband. We operated smoothly and easily worked long-haul DX. Father Dan proudly showed us off, explaining how he could easily break through the pileups with my 500 watts and dodge nearby QRM with the passband tuning on the 75A-4. This was the age of "Once-In-A-Lifetime-Solar-Conditions," Cycle 19.

1960

One day Father Daniel was reading *CQ* and said out loud, "Wow, they made a transmitter and receiver in the same box! It's called a *transceiver*! And look at how small it is! If I had one of those, I could take it, instead of the old Gonset AM rig, with me on the expeditions!" Well, that sure hurt my feelings. I had thought that the glory years would never end.

Pretty soon a new box from Cedar Rapids was delivered to our shack and the young upstart was being unpacked. He was all small and gray-looking and had this tiny power supply! How could this little "trampseever" ever replace the stately grace of us Twins? But replace

#4, the Collins KWS-1 transmitter, who, with the help of a leaky capacitor and a PC in Germany (and his owner, K1KP, looking the other way), is able to tell us his life story in this article. (Photo courtesy K1KP and #4)

us it did. We stayed around at Father Daniel's shack for a few more years, but more and more he operated with the upstart rig (a KWM-2). After a few years, I was about to be disappointed and learn that after all the good times, I was really nothing more than property, to be bought and sold at will.

One day Father Daniel had a visitor, Tom. I sensed something was different, as Father Daniel explained, "You should always preset the Tune and Load controls." A few minutes later Father Daniel and Tom shook hands, and Tom gave Father Daniel a stack of crisp, new greenstamps. Father Daniel started disconnecting all my cabling and neatly tying it up with string. We were loaded into Tom's black Studebaker station wagon.

Tom preferred working CW. He was a really smooth CW operator; he hardly ever used us on SSB. He loved to get on 40 meters each evening and check into the traffic nets. Oh, how we moved traffic! He installed a narrow 500-cycle filter in my sister the 75A-4, and we never missed a beat. Tom cruised along at 35 to 40 words per minute, copying whole sentences in his head as pounded the keys on his "mill." He had a Vibroplex hooked up, and boy could we make beautiful music together! Sometimes he'd get on with his friends and race along at 50 words per minute, just for fun.

We had a good run with Tom, but it was short. Before I knew it, Tom was interested in something new from Cedar Rapids called an S-line. I bet you can guess what happened. Tom put an ad in CQ that read: "For sale: Collins Gold Dust Twins KWS-1 and 75A-4, Exc Condx, 4CX250s, well maintained and clean. $1900 pickup only from Waltham. W1???, TR-3214."

1962

Tom got a landline from a ham in New York who was looking for a "good deal" on a used setup. The following weekend, my third owner, Jeff, showed up with his big, old "woody" station wagon to take us to his postage-stamp home in Albany, New York.

Jeff's place was awful. The shack was a mess. He set us up next to a bunch of strangers named Johnson and Hammarlund. Whenever they talked, my sister could understand them just fine, but whenever I spoke, they just laughed and called me "Donald Duck"!

Jeff had a really short flattop antenna thrown in the trees. Oh, he had a tuner, of course, some sort of bed-spring contraption mounted on the ceiling. Jeff would ruthlessly flip me on and go key-down into the worst SWRs! My transformers would groan as my plate current meter went off scale! All my own power was coming right back at me! Finally he'd get the bed-spring tuned up, but by then I was so hot I couldn't keep my frequency straight.

Jeff would shout into the microphone trying to work DX with his wet-noodle antenna. It didn't help that solar conditions were now in decline. Jeff would shout for hours, then realize he had me

off frequency or on the wrong sideband. He'd give up in disgust and curse me as if it was my fault! It makes my final tube seals hurt just to think of it.

Jeff tired of me quickly. We kept hearing newer rigs on the air, with names such as National and Heathkit. Jeff sold me, but kept the A-4, which he said was "the best receiver he ever had." The last I thing I remember was my sister copying Gus Browning, W4BPD, on 20, as Jeff and his beer-belly friend loaded me into his car to sell me at the Rochester, New York hamfest. He pulled into a grassy parking space off the dirt road. He set me on the tail gate with a cardboard sign that read "KWS-1, brand new, $1000 or best offer."

I didn't like that place. There were rigs of all sorts for sale. There were even the dissected carcasses of old transmitters and receivers. Dust blew into my ventilation holes. I was afraid I'd lose my alignment or get dust into my PTO.

Late in the afternoon an older ham walked by. "I'll give you $900 for that old KWS-1," he said. Old! Who's old? I could still do 600 watts out any time!

Jeff replied, "Well, it's late and I don't want to lug that thing home. How about $950?" The older ham came back with "What about $925?" "Sold!" Jeff said. Jeff helped my fourth owner carry me to his pickup truck. His name was Bill, and he was a retired Army Communications Officer. He had a bad back and couldn't carry me. Jeff walked away laughing; "I woulda taken $800, ha ha..."

1968

Bill took me home and set me up. He bought me a new partner, a used 75A-4 (#2208) he noticed in the Amateur Electronic Supply ad from the October 1967 issue of *CQ*. Bill was a MARS operator. His antennas were tuned outside of the ham bands, and together we passed MARS traffic from soldiers in Vietnam to their loved ones in New England. It was sad, because sometimes there'd be traffic passed regularly every week or so from a soldier to his family and then it would stop suddenly. I was proud to help out my country, but sometimes it was enough to make your mechanical filter break. Bill was a regular, never missing a sked until the war was over and our boys came home (the ones who could, anyway).

1973

When the war was over, Bill sold me to two hams who were forming a club at a nearby college (#2208 went to Bill's brother-in-law in South Carolina). Eventually the original club members graduated, and after several years the college had to take over the club room for something new—computers. I was sold again.

1980

Fred lived with his XYL in White Plains, New York. Fred didn't have a callsign! He had just one antenna, a small two-element, 11-meter quad on the roof, but he thought he was some kind of cool when he got on the air. He bragged about having a "slider" and a "full gallon." No one else used callsigns either; they just used funny made-up "handles." I guessed maybe the FCC had gone broke and went out of business, because I never seemed to hear any ham callsigns anymore.

One afternoon Fred got into this crazy argument with someone who was really a lot louder than he was. Fred was yelling and screaming, really pushing me into grid current, if you know what I mean, when all of a sudden Fred started to overheat. His face turned all red and sweaty, and then he got some parasitics or something, because he started making funny squeaking noises. I

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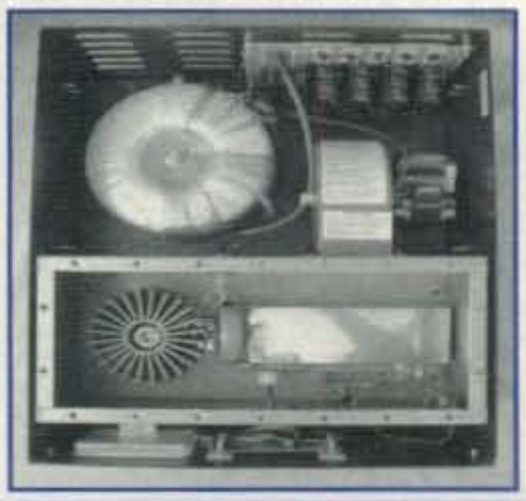

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Building a KWS-1 Database

Tony Brock-Fisher, K1KP, #4's current owner, is collecting and maintaining a database of information obtained from current KWS-1 owners by serial number. If you haven't already done so, please send him an e-mail at <k1kp@arrl.net> to obtain a fill-in-and-reply survey. Also, if you're the proud owner of a KWS-1 that hasn't been powered up in some time, e-mail Tony for a copy of "Bringing Up a KWS-1," a detailed checklist of measurements for checking out a long-dormant KWS-1.

guess poor old Fred must have blown some kind of major fuse, because his head fell onto the desk, right on the PTT bar of his D-104. Fred didn't make another sound for over an hour, while I was key down, with dead air.

Finally the landline rang, and then Fred's wife came running into the shack. It turned out that Fred had gone SK, and she was crying and wailing all over the place. She had to call the doctor to get Fred out of the house, and the doctor finally shut me off—for a long, long time.

1982

Fred's wife had all his radio gear moved into the attic. I ended up on top of an old steamer trunk. It was dusty and moldy up there. In the summer it was so hot the wax started to melt off my capacitors. When it rained, it was so humid I could feel all my Black Beauties swelling and starting to crack. Little did I know when I went into the attic that it was a ten-year prison sentence.

1992

One day an ambulance came into the driveway. It stayed for about an hour, then slowly drove away again. Mrs. Fred had gone SK to join Fred. Along with the rest of the contents of the house, I was loaded into a big red truck that read "Estate Sales – Auctions – Antiques" on the side and driven away to a big barn to be stored again. If I had thought ten miserable years in the attic were bad, the years in the barn were the worst. It was much colder in the winter. It was drafty, and nothing prevented the cold, humid air from blowing through the walls and right through my chassis. Mice decided that the air intake to my finals was actually an inviting entranceway to their newfound home. The trouble with mice is every room in their house gets used as a bathroom. I had sunk from the most advanced Collins amateur transmitter to mouse toilet. I went into a kind of suspended animation, where time became a blur of seasons strung together. I had hit the bottom.

This was the true nadir of my life, when all the people around me thought I was worthless junk. My very survival was due only to the laziness of the antique dealer, who never bothered to clean out the huge barn.

Every once in a while the dealer would let his favorite customers take a stroll through the barn to see if there was anything they wanted. One fall day a couple came in, picking their way through the precariously piled stacks of layered trash and treasures. I could tell the husband was less than thrilled, judging by the grumpy look on his face and his grunted comments. His large wife continuously ran her mouth with a stream of consciousness evaluation of all that she saw. Just as she was explaining to him, obviously for the umpteenth time, how she expected to find a rare Hummel or a Dickens' first edition, his face brightened as he saw me. He became oblivious to her prattle as he took a closer look at me, lifting the lid on my RF deck to see if I was "all there." A bargain was struck for an embarrassingly low figure, and I was on my way out of the barn. I was so glad to leave that I didn't care where I went. I was elated because someone actually thought I was worth saving!

2000

The husband who had spotted me in the barn decided to make a quick profit on his find by selling me immediately. I arrived at another hamfest, Hosstraders in New Hampshire. It was fall, cold, and intermittently rainy. No one seemed very interested in me. Didn't they know I could produce a really clean QRO sideband signal? I shivered through the October night. Saturday morning dawned brightly, and hams started walking briskly down the paths in front of the sellers. A few folks stopped by to take a look, mostly out of curiosity. "Hey, look at that!" they said to each other. "What a boatanchor!" I didn't know what the term *boatanchor* meant. I'd never heard it before. Maybe it meant "really cool" or "valuable." I hoped so. I hoped it didn't mean "junk" or "antique."

Before lunchtime arrived I had been sold for the tenth time in my lifetime. Jon, my tenth owner, seemed to be a collector of contemporary radio equipment. Contemporary with myself, that was. On the top floor of his Cape Cod style house he had a tiny shack which was lined with shelves holding many different radios, some my age, some even older. I felt pretty sure that Jon would bring me back to life. He seemed excited with the prospect at first, gathering information and some replacement bearings for my blower motor, which had long since dried out and seized up. However, after an initial flurry of activity, I once again lay silent, this time partially disassembled, for a couple of years. Other rigs came back to life on Jon's workbench, but I sat unattended, waiting my turn. Eventually, Jon realized he lacked both the interest to finish my restoration and the space to accommodate me. He listed me on a new form of want advertiser—the Collins' lists on the internet.

2002

I first saw my present owner, Tony, one night a year ago. He seemed nice enough, though strangely critical. After talking jovially with Jon for an hour or so and inspecting me carefully, they made a deal, and once again a stack of green-stamps was counted out and changed hands (considerably more than changed hands at the antique dealer!). Oh, how they huffed and puffed to get my power supply back down all those stairs and out to Tony's truck.

Tony started right in working on me, wasting no time in putting me back together. He started by working on my power supply, carefully checking out resistances and making voltage measurements. It was a long process, this gradual reawakening, much longer than my original birth. At times my power supply would groan, smoke, arc, and blow fuses as power was applied to long shorted and leaking capacitors. Each time Tony would cut out the offending part and replace it. I was gaining strength, power, and hope with each replacement! I was starting to feel as if I might actually make it back on the air!

Finally my power supply was pronounced to be up to snuff. My RF deck was connected, and I was powered up completely for the first time in 21 years. Oh, it felt good to breathe again, as the blower came on and forced air once again over the cooling fins of my finals! There were many more episodes of smoke, and when the smoke cleared, almost every single Black Beauty capacitor had been replaced (except, of course, the one in my VOX circuit that allows me to tell my life story).

Then there was RF, but excessive and uncontrolled, as I oscillated wildly out of control because of some "modifications" that my 11-meter owner had made. Those took a good three weeks to figure out, but Tony finally discovered the

improper replacement of a feedthru capacitor in my RF negative feedback circuitry. With that repair completed, I was treated to a complete "makeover," with new knobs, a thorough cleaning, new dial overlays, and even new black screws in my front panel. I felt 40 years younger!

I'm paired up with a 75A-4 again, my second partner #2208 from years ago. Miraculously, she spent 30 years down in South Carolina, only to be bought by Tony through eBay before he bought me. We check into the Collins nets in the evenings and chat with other sets of Gold Dust Twins who have somehow managed to survive to reach their golden years.

As transmitters and receivers, we each are time capsules, snapshots of the latest and greatest technology on the day we are born, powered up, and aligned. We enter into service to hams bringing with us the promise of fulfilling the five principles of the Amateur Service: emergency communications, advancement of the radio art, advancement of communications and technical skills, expanded pool of trained radio operators, and international goodwill.

As we do so, time and technology march onward. While we are serving, we are also aging, as newer technology makes its glacier-like advance to supersede the old. Our perceived value follows a downward slope, eventually reaching an ebb, when we are seen as totally obsolete and usually valueless. This is the most precarious point in our existence, far more dangerous than the first application of power to untested circuitry, for there is a support system present at that time. No, when we are in the depths of our value, we are vulnerable and alone. Vulnerable to storage in unhealthy places, where heat, cold, moisture, dust, and rodents do their best to destroy us. And what those elements cannot accomplish, our total demise, is often made final by people who need the room in their garage or attic for "more stuff." Some of us are converted in Frankenstein fashion from working transmitters and receivers into the strangest things, such as linear amplifiers or storage cabinets. Still others, having suffered a failure in a major component, become organ donors, getting "parted out," donating unique components so others can continue to serve.

But despite all odds, some of us survive to enter a reversal of fortune, a time when our value again ascends. We are extremely fortunate indeed to literally be rescued from the trash heap by some OM or YL who sees us as a diamond in the rough, to be brought back to life and treated with the appreciation and respect we deserve for having served our place in the history of the advancement of the radio art. Indeed, the value of some of the rarest and most significant of us can soar to ridiculous levels, after we live through the "time of being junk."

Those of us who remain in service are the lucky survivors of that terrible time when even hams thought we were useless. Now we are valued highly, for our part in history, for our beauty, and for our artistic implementation of the radio dream—to speak with others half a world away, and do so day after day in style.

Next time you're at a hamfest, flea market, or perusing the web auctions and come across a boatanchor, please consider giving it a good home, rescuing it from a fate worse than a shorted primary, and preserving and appreciating the history of radio. Please remember, too, we are happiest when used on the air frequently! ■

Note: While portions of this story are true, most of it is entirely fiction, given an air of authenticity by connection to actual persons and places. Any such connections are intended to be fictional only, and no offense or characterization is intentional.

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how it works

BY DAVE INGRAM,* K4TWJ

Kit Building and Successful Soldering

As promised in our QRP column in the January issue, and thanks to Eric Swartz, WA6HHQ, and Wayne Burdick, N6KR, of Elecraft, the special feature this time is a "hands on" guide for working with modern PC boards and small components. Whether your interests include homebrewing, kit building, doing light repairs and/or modifications on gear, or simply learning how it is done, I am confident you will find our discussion beneficial. I must say, locating such ground-floor information in today's high-tech world is becoming increasingly difficult. I have taught college-level electronics—both theory and hands-on practice—for several years, and I can definitely say that Elecraft's guide sheets for working with small hand tools and doing fine soldering, such as the instructions included with their kits (and spotlighted herein), is tops. In sharing the highly detailed photos and figures, Elecraft is also making a most commendable contribution to our wonderful world of amateur radio! Let's begin with, appropriately enough, some notes on selecting the right tools and visual aids for doing fine, detailed work.

Photo B– Additional and always appreciated items for working with small PCB projects. A pocket-size tube of extra-thin solder and a small roll of solder wick are adequate for most "extended weekend" projects. One or two disposable wrist grounding straps to avoid static-electricity damage to sensitive components and a magnifying visor complete the list.

The Tools and Visual Aids

Generally speaking, working with small components and fine-detail PC boards requires equally small-size tools plus a steady hand and reasonably good eyesight (or a good magnifier). Here we are referring to "small" as standard-size transistors and ICs, 1/4-watt resistors, and approximately 3/16-inch diameter disc capacitors, or regular PC-board-type components. A temperature-controlled soldering iron or "soldering station" in the 30- to 40-watt range with a flat blade or screwdriver-style tip of 1/32 to 1/8 inch wide is a smart choice for this and most PCB work (photo A). If the tip is temperature-rated, a range of 600° to 700° Fahrenheit is fine. Using a lower wattage iron or round tip usually does not deliver enough heat for this type of soldering. Likewise, higher wattage irons may damage boards or components. Tip widths are often influenced by availability and personal preference, but I find even 1/8 inch a mite wide, and 1/32 inch avoids "bridging" adjacent solder pads on crowded boards.

Equally important is the grade or mix and size solder you use. The popular choice here is rosin-core of the classic 60% tin/40% lead, 63% tin/37% lead, or 62% tin/36% lead/2% silver mix with a diameter of .020 or .022 inch (similar to 24-gauge wire). When using the right-size solder and iron, most PC board pads can be soldered in one to two seconds. Just count as you solder—one Mississippi, two Mississippi, stop soldering. Incidentally, a convenient source of reasonably priced soldering irons/stations, solder, desoldering wick, wire cutters, and related items is Mouser Electronics, 1-800-346-6873, or <www.mouser.com>.

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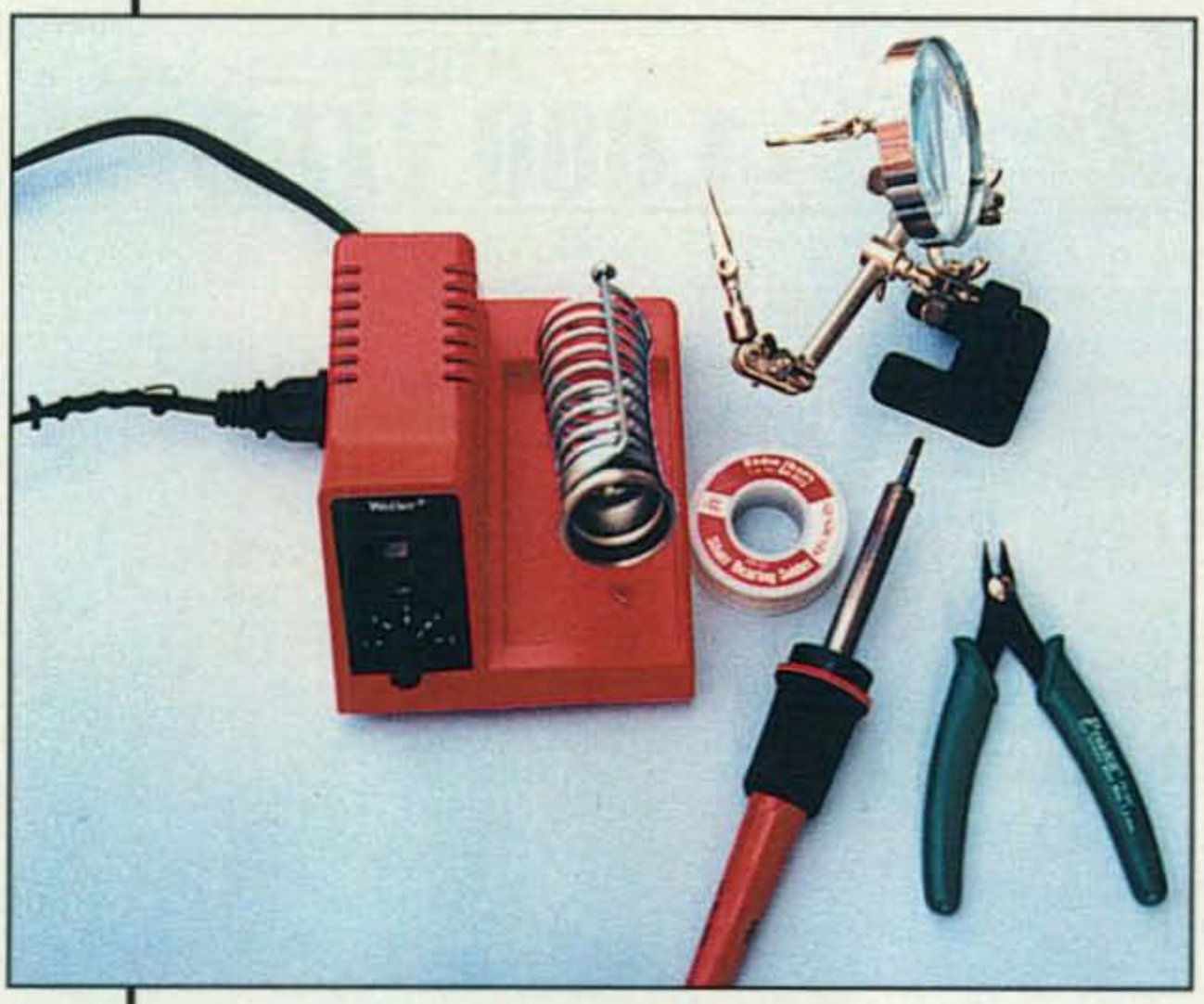

Photo A– Some of the basic tools required for working with PCB-type projects at home. Items include a temperature-controlled 30- to 40-watt soldering iron with "screwdriver" tip, ultra-thin (.022 diameter) solder, flush-cutting wire nipper, and a small vise or "third hand" with magnifier.

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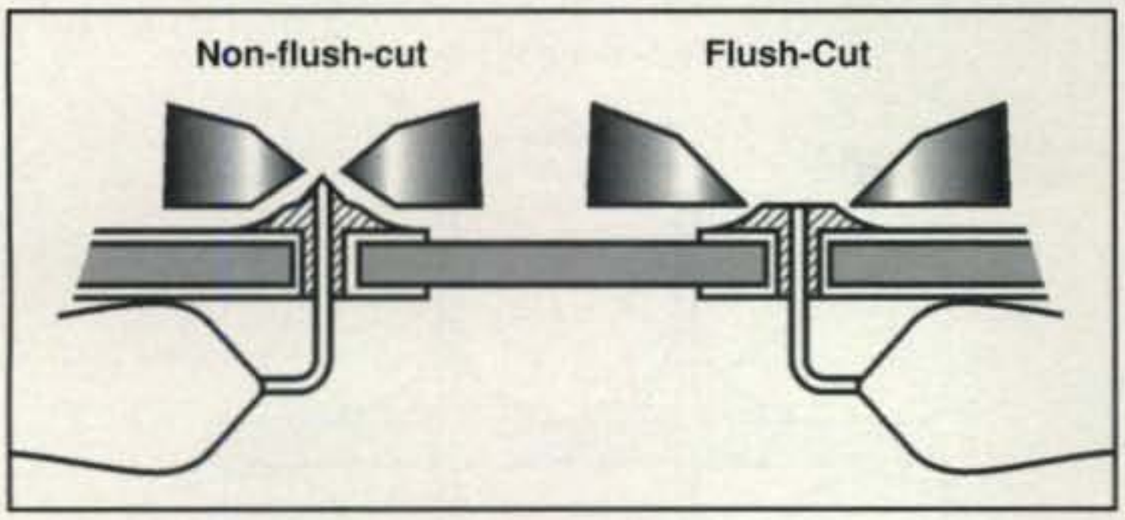

Fig. 1– Graphic comparison of regular diagonal cutters that are beveled on both sides and typically flare or mound-up a solder joint (left) and a flush cutter that is flat on the bottom and only beveled from the top (right). A flush cutter clips leads barely above PCB surface and makes cleaner cuts that are less likely to short with adjacent solder pads. (Courtesy Elecraft)

Several additional items required for working with small components and PC boards are shown in photo B. They include narrow-width (.030-inch) solder wick for desoldering (everyone makes an occasional mistake), flush-cutting wire "nippers," small-tip needle-nose pliers, and a small vise or "third hand" to help hold a PC board. Flush-cutting nippers differ from regular diagonal cutters in that their wire-cutting blades are beveled only from the top so that they fit flush to a PC board and make flat, clean cuts that are less likely to short to nearby pads (fig. 1).

Seeing your work in clear and magnified form is vital for producing a good finished product, and a good viewer even helps you stabilize unsteady hands. I use a low-cost Mag Eyes viewer with two interchangeable magnifying lenses obtained from Nancy's Notions (1-800-833-0690). It really makes small work *big*. As an alternative, you might use the (moveable) magnifying lens included with most "third hand" devices. Like to try something unique? Purchase a large replacement fresnel (magnifying) lens for an overhead projector, elevate it at its corners with a few books, and then work on your project under the lens, using it as an oversize magnifier. Too eccentric? A swing-down, boom-mounted, and illuminated magnifying visor also works well. Anything that magnifies views and minimizes eye strain is a good investment.

Checking New Components

Just because a component is new does not guarantee it is good, or that the component is exactly what you think it is.

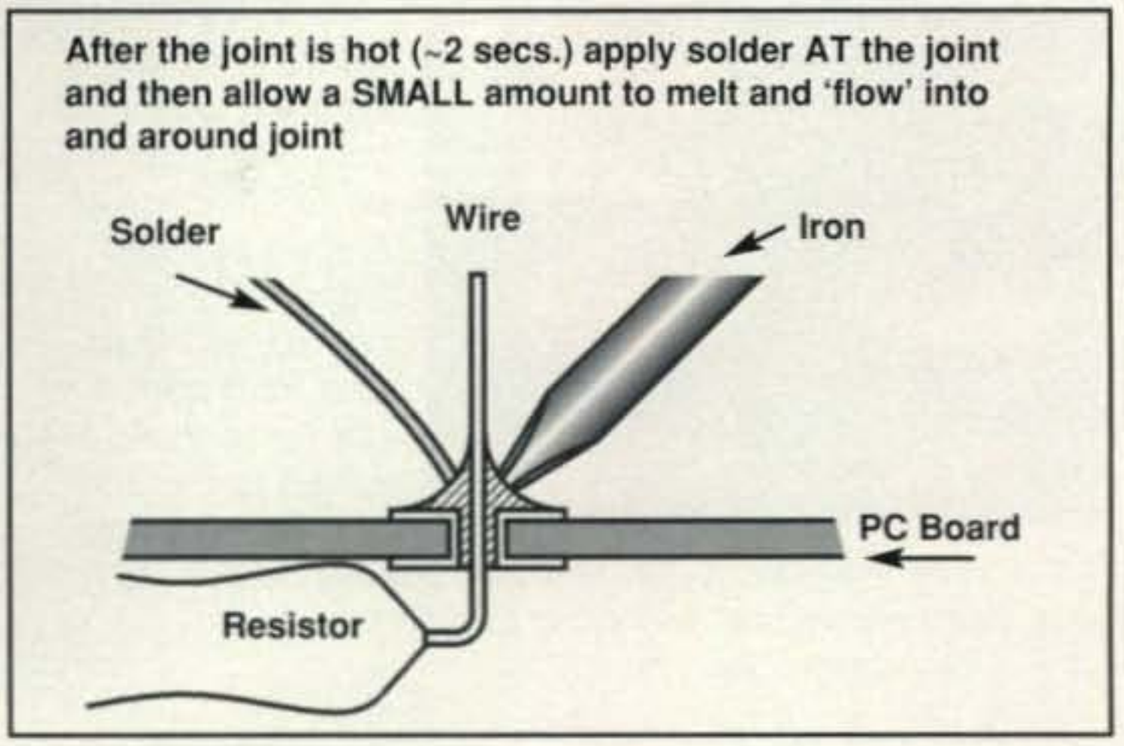

Fig. 3– Good soldering is an easy-to-learn skill. The soldering iron's tip must be in contact with both the component lead to be soldered and its PCB pad. The soldering iron's tip will then heat the lead and pad, and their combined heat will melt the solder. (Courtesy Elecraft)

Some molded inductors, for example, look like, and are color coded similar to, resistors. Taking a couple of seconds to check such items with your trusty ohmmeter adds reassurance while familiarizing you with various components. Checking resistors obviously is a cinch. Small/disc capacitors should exhibit infinite resistance. Large-value capacitors (100 or 200 mFd, for example) typically exhibit low initial resistance, then increase to infinity as they charge on small voltage from the ohmmeter checking them. Reverse the ohmmeter's leads, and you will notice another "kick" to low resistance followed by an increase to infinity. I vividly recall troubleshooting a homebrew SSTV monitor for three or four days several years ago and finally clipping out and measuring a (new) capacitor. It was totally shorted. Now I quickly check each capacitor before and after installation. Variable resistors, variable capacitors, diodes, switches, and sockets can also be checked quickly with an ohmmeter, and it is time well spent. Transistors, ICs, and especially microprocessors are quite sensitive to damage from static electricity or ESD (electrostatic discharges), so assuming they are good and handling them as little as possible before installation makes sense.

Staying ESD Safe

Remember those times during cool, dry weather when you walked across a carpet, started to touch a metal doorknob,

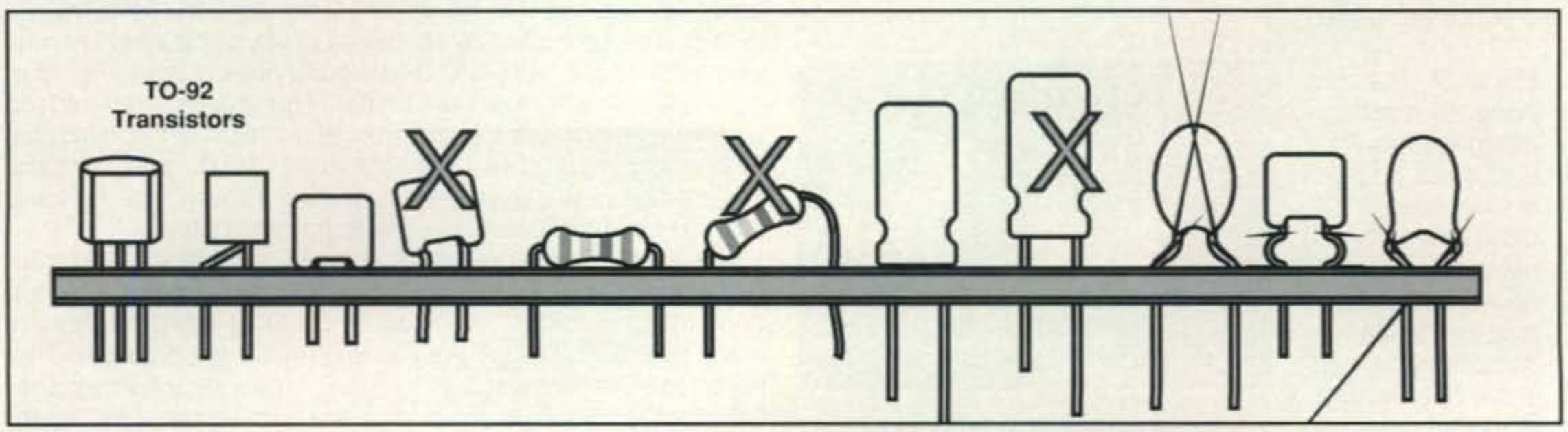

Fig. 2– Examples of right and wrong (X) ways to mount components on PCBs. Straightening or reforming leads with needle-nose pliers so components sit straight with the board is occasionally necessary. (Courtesy Elecraft)

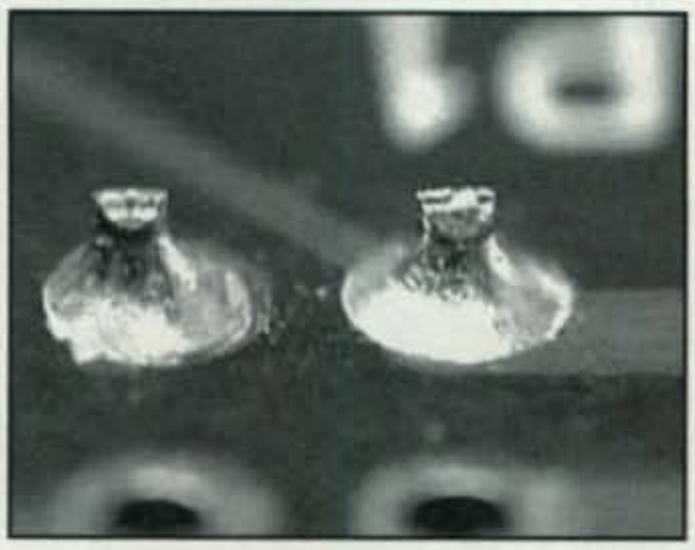

Photo C– Two adjacent and well-soldered PCB pads. Solder was melted by heat from the component lead and PCB pad, and not by applying the solder to the iron and letting it flow onto the pad. Avoid applying excess solder, as it can mound up and short to adjacent pads. (Courtesy Elecraft)

and a spark jumped from resultant static electricity? Such electrostatic discharges, or ESDs, are quite detrimental to transistors, ICs, and microprocessors. Also, like lightning spikes from summer thunderstorms "pecking" at front-end transistors or ICs in TV tuners and radios, unrealized damage can accumulate and show up later in time (duh . . . what caused that?).

How can you minimize ESD problems? Always touch an unpainted and grounded metal surface or object before handling transistors, ICs, or microprocessor chips, and prior to each assembly step with PC boards containing those items. For even better static protection, use a grounded wrist strap and if you can afford the cost, an ESD-safe soldering iron/station and anti-static work mat.

Say your budget is tight? Mine, too. I opt for the Disposable Wrist Straps from Mouser Electronics. They cost one dollar each and are good through at least two kits or projects if handled with reasonable care. I use a large, metal floor lamp as a grounding post and occasionally even quickly touch my (non-ESD) iron to it for grounding and reassurance. I also avoid moving my feet beneath my chair or working on ESD-sensitive boards immediately after walking across a room. Common (electronic) sense is the key to safety.

Soldering Savvy

Although a fair number of amateurs are technically minded and have some electronics background, most of us learned to solder through personal experience. As a natural and quite understandable consequence, some homebrewers and kit builders may solder connections improperly, use too much solder, or short-change actual iron-to-junction soldering time. Adopting new habits or techniques can seem challenging for sure, but give it a good old college try. The long-term rewards are worth the effort.

Photo D– If a component's lead along with its PCB pad is not heated, a "cold solder" rosin joint will result. Solder will flow onto the PCB pad, but since the component's lead is not hot enough to melt solder, rosin will accumulate around the wire. Solder then forms around the rosin, isolating the lead from its connection. (Courtesy Elecraft)

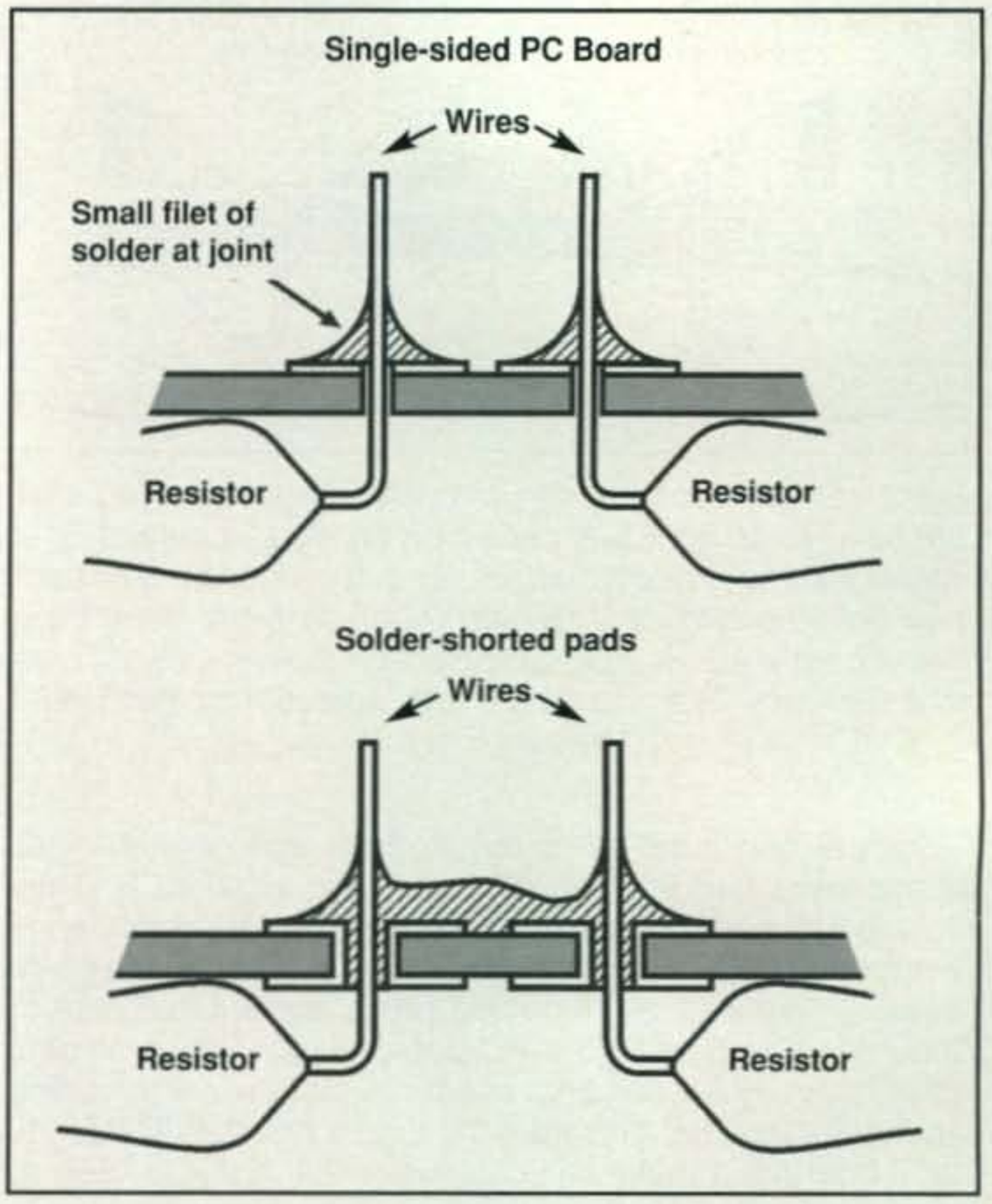

Fig. 4– Study this figure and you will see adjacent PCB pads in "A" have been soldered accurately, while adjacent pads in "B" are shorted from excess solder. Avoid this common pitfall by using only enough solder to do the job. (Courtesy Elecraft)

Generally speaking, components such as resistors, capacitors, etc., should be mounted flush with a PC board. Some examples of both right and wrong ways to mount components are shown in fig. 2. When soldering mounted components, the iron's tip should be in contact with both the lead to be soldered and its associated PC board pad, as illustrated in fig. 3. The iron's tip then heats the lead and pad to be connected, and their combined heat melts the solder and ensures a good, solid electrical joint after lead trimming (photo C). If a component lead and its PC board pad are not heated adequately, solder melted by the iron flows onto the pad, but rosin accumulates around the lead and solder forms around the rosin (photo D). Some folks call this a "cold solder joint"; it looks like it has been soldered, but there is no electrical connection. This type of joint can be corrected by reheating. This same effect results when the copper wire on hand-wound coils is not stripped of its enamel coating and then tinned. The enamel prevents the wire from being heated by the iron, and a rosin junction results. In this case, the lead should be removed from the pad, stripped, tinned, and resoldered—and continuity through the coil and its PCB pads then rechecked with an ohmmeter.

Continuously critique your work after soldering and trimming excess lead length. If your wire cutters seem to cut too deep into the solder, as shown in photo E, you probably are using too much solder. As you will recall, good solder junctions look like those shown photo C. Applying excess solder has another pitfall: It can bridge or short adjacent PC board pads, as shown in fig. 4. This is when the solder wick mentioned earlier is required. Exercise caution to avoid damaging already heat-stressed components and PC pads when

Photo E– An example of a solder joint with too much solder. Notice how flush cutters have sliced deeply into the mound of solder when trimming component leads. (Courtesy Elecraft)

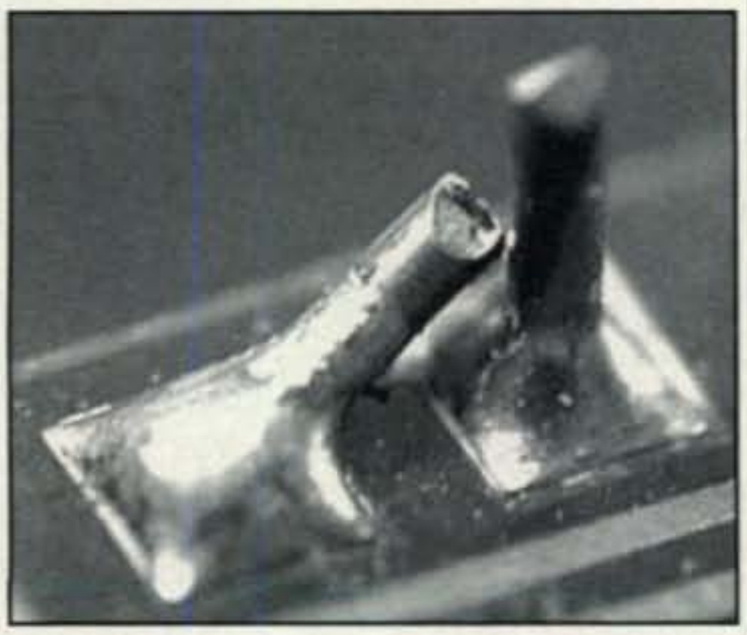

Photo F– Here adjacent PCB pads/connections are shorted by a component lead left too long after soldering and trimming. Flush cutters and a good magnifier help sidestep this common pitfall. (Courtesy Elecraft)

wicking up excess solder and then recheck your work with an ohmmeter. Rivaling bridged solder connections are accidentally shorted component leads that are not clipped close enough after soldering (photo F). The lead falls (or becomes pressed) against an adjacent lead, possibly damaging transistors or ICs during initial turn-on and checkout.

Finally, remember the old proverb "practice makes perfect." Fine-tune your soldering-skills technique using scrap PC boards and low-cost components before working with "the good stuff." Keep your iron's tip whistle clean with an occasional quick wipe with a paper towel or sponge. Maintain diligence and enjoy the confidence of knowing "you can do it" if and when desired or necessary.

In closing, we again thank Eric Swartz, WA6HHQ, and Wayne Burdick, N6KR, of Elecraft for sharing many of the views in this month's column. Folks such as Eric and Wayne, and companies such as Elecraft, keep amateur radio's proud legacies and traditions alive and standing tall! 73, Dave, K4TWJ

beginner's corner

BY WAYNE YOSHIDA,* KH6WZ

Say What You Mean; Mean What You Say

Recently, I was a passenger on a shuttle van heading home from the airport. The commute home from the airport brought forth an interesting conversation about the need for clear, succinct radio communications.

As a radio ham, I couldn't help noticing the commercial two-way radio gear and the data terminal installed in the vehicle for the shuttle driver. The FM transceiver had very good coverage from the airport to several counties. The data terminal was interesting to look at, but I couldn't help thinking that the device was an unsafe distraction while driving. I could hear other shuttle drivers' chatter on the channel; at times it was somewhat funny, but some things made me cringe.

I thought there was a bit too much "ten-four, come back" CB-style chatter on the channel. I asked the driver about the radio system and what he thought about it. I asked if they received any radio communications training for the job.

The driver replied, yes, a short course on radio etiquette is one of the first things given to new drivers. For example, the driver said that they are trained to ensure that the passengers are transported from the airport to their homes (or vice-versa) quickly and efficiently. Thus, the things passengers hear on the two-way radio should never cause concern. Also, since you never know who is listening to the radio, they are told that all conversations should be short and professional at all times. Don't say something like, "Hey, I'm lost. Where am I?" Never ask for directions, either, because passengers don't want to hear they are lost. Instead, call the dispatcher and say, "What is the *best* way to get to this address?" or "What is the *fastest* way to get to this address?" Notice how the "acceptable phrases" have an emphasis on speed and efficiency (positive statements), rather than incompetence (negative statements).

The driver had a lot of fun talking about the various drivers and their quirks. It was an entertaining conversation. Then, a bit sooner than I had expected, I was home.

As we talk on our ham radios, we really need to think about what we are saying, because we don't know who is listening. The radio is an open party line, with no privacy whatsoever. Think of this as gossip. If you are worried that what you say will get spread out by others far and wide, it may be best if you don't say whatever it is at all. This rule applies to all of our radio operations, regardless of the frequency band or the time. Radio signals don't know of any boundaries except for the laws of physics, and it is very possible that our transmissions can be heard thousands of miles away.

Think about that for a second. That is a lot of power. Your words are being sent out via the antenna and through the ionosphere and can be heard by anyone tuned to the frequency you are using. If you are talking on HF or via a gateway system connected to the internet (such as IRLP), your words are being transmitted even farther.

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"Bring Home Charo" and Other Areas of Confusion

A series of funny TV commercials about noisy cellphone connections reminds me of how words can be scrambled and misunderstood, often with humorous results. If you listen to your favorite repeater system, you may hear some funny or strange things as well. Even with the clarity of FM and the signal strength of repeaters, there are times when the English language just makes things "clear as mud."

Certain phrases in the English language can have multiple meanings. Even the way you say something can change meaning. Although this might not be critical in everyday use, it can be very critical if you need to pass some important piece of information during an emergency, or when you are passing messages on behalf of others.

In the Huntington Beach *RACES Handbook*, one of the examples of careful word choice includes the phrase "Baby swallows fly." Can you see the confusion this might cause? Simply by adding a few words to clarify the statement, we can create a phrase that will not cause confusion. We can say instead, "Baby swallow birds fly south in the winter." (I don't want to think about the "other" interpretation.)

Throw in weak signal strengths, some nearby interference, or someone with an injury that impedes clear speech (like the time my face and jaw were all swollen from a root canal), and the other party will have a difficult time understanding you, wasting time. For instance, if Elmer Fudd had a callsign containing the suffix RR, the standard International Telecommunications Union (ITU) phonetic alphabet would have to be used (see Table I). Trying to be cute and saying something such as "Red Rabbit" is easy to remember, but very difficult to understand.

I still remember one Field Day exchange from many years ago. I will delete the prefix here, but it went something like this:

"CQ Field Day from xxx Wed Wabbit, xxx Wed Wabbit."

"Is that xxx Romeo Romeo or Whiskey Whiskey from Whiskey Six Yankee Romeo Alpha."

We had to waste several precious seconds trying to figure out what the callsign was. During all that time we could have made several more valid contacts.

Most of us are familiar with the phonetic alphabet, and even non-hams can sometimes understand the use of words to replace individual let-

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A	Alfa	N	November
B	Bravo	O	Oscar
C	Charlie	P	Papa
D	Delta	Q	Quebec
E	Echo	R	Romeo
F	Foxtrot	S	Sierra
G	Golf	T	Tango
H	Hotel	U	Uniform
I	India	V	Victor
J	Juliett	W	Whiskey
K	Kilo	X	X-ray
L	Lima	Y	Yankee
M	Mike	Z	Zulu

Table I– Use of the ITU phonetic alphabet is the best way to ensure that a callsign will be copied correctly.

ters when describing something. The earliest examples of this letter-number stuff and two-way radio jargon I can remember come from my favorite old TV shows "Adam-12," "Dragnet," and "Emergency!"

Do it with Style

One of the things that sometimes irritates me (I must be getting grouchy in my old age) is when someone identifies "backwards." For example, the "backward IDer" would say something like this: "This is KH6WZ calling WB2D" or "KH6WZ to WB2D." It is much more efficient when the station *being* called is mentioned *first*, followed by the calling station, like this: "WB2D *from* KH6WZ." Keep it short and snappy. As Strunk and White would say in *The Elements of Style*, "Omit needless words."

Calling and identifying backwards is especially confusing when more than two stations are communicating with one another in a communications network or net. All stations should be listening for their callsigns, standing by for instructions or information addressed to them. Identifying backwards throws the rhythm off and can cause confusion.

Now before I get some comments about this, let me say that the FCC does not necessarily require the operating procedures I am recommending here. It just makes communicating more efficient and effective. Let's call this an "operating style."

Use Common Courtesy

Do you have a daily commute to work that lasts for a while? If you have your radio tuned to your favorite repeater frequency, you will be able to hear all kinds of chatter every morning. Have you ever listened and wished you could join in the conversation, but couldn't get in? At little later on in the column I'll suggest a way to "break in," but first here are some

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basics of repeater operating that may prove useful.

On busy repeater systems there is usually a feature called a "courtesy tone" or a "time-out timer," or perhaps both are installed. The features are there to remind users to share the system and not be "alligators," or those who only talk without listening. You don't want to be one of those. You want to be known as a courteous operator, sharing the machine. Before the time-out timer kicks in, you let go of the PTT (push to talk) switch and listen. Let someone else have a turn.

By the same token, if you are listening, you should wait for the courtesy tone and then key your microphone and start talking. If you "jump the gun" and squeeze the PTT switch before the tone, two things happen, neither of which is good. First, you are on the other station's time, which means that the time-out timer is still ticking away, making your transmit time shorter than normal. Second, by taking a turn to transmit immediately, you are not giving any other station a chance to transmit. This is selfish, and even worse, if someone has an emergency to report, he or she must wait until you are done to transmit the emergency information.

Can you imagine what could happen if you tie up the repeater like this? While you are gabbing about what you had for dessert last night, or how many beers you consumed at that football party, a fellow repeater club member is trying to ask for help because his car slid off the road, hitting a tree. He whacked his head on the steering wheel, and he is bleeding profusely. How would you feel if you were responsible for blocking his call for help?

Remember that almost all repeater communications are in "half duplex" mode, which means that unlike your telephone, only one person can talk or be heard at a time. When you have the microphone and you are transmitting, no one else can talk. The whole world is captured (sometimes willingly, sometimes not so willingly) and cannot get away. The only recourse is to change frequency or turn off the power.

May I Have this Dance?

Getting back to the topic of "breaking in," each station transmitting should pause for a few seconds after the courtesy tone to allow others to break in. This is especially important to consider when the repeater is busy with lots of users. If everyone cooperates, all stations can have an enjoyable experience. This is exactly like "cutting in" for a chance to dance with someone otherwise occupied with another partner.

An on-the-air gathering with several people is sometimes called a "roundtable." Common courtesy should kick in when entering this sort of conversation on the radio, and everyone takes a turn as they join the conversation.

The first rule of roundtable operating is listen, listen, listen.

Listen to see what the local custom is for breaking into an ongoing QSO. If you are not sure how to do this, just ask. Avoid the use of the word "break," since this is most often considered a CB term, and you may find yourself shunned by others. Usually you wait for an appropriate time and announce your presence with your callsign, just once.

Remember, just like being at a dance and asking if you may cut in, the other persons may or may not allow you to join the conversation. Don't be offended if you are not acknowledged right away. Maybe they didn't hear you the first time, or maybe they are busy trying to get some important information through. Patiently wait for another pause and try again. Again, though, you may or may not be invited to join in. If they ignore you, take the hint and go away. Don't be a pest and don't get angry.

The second rule is be polite and ask. Don't just barge in! Use common sense and don't do anything you wouldn't do in a normal face-to-face conversation.

Let's see if we all can speak as clearly as possible and operate with style and grace. After all, you are developing an on-the-air reputation each time you squeeze that PTT button or hit the key.

73, Wayne, KH6WZ

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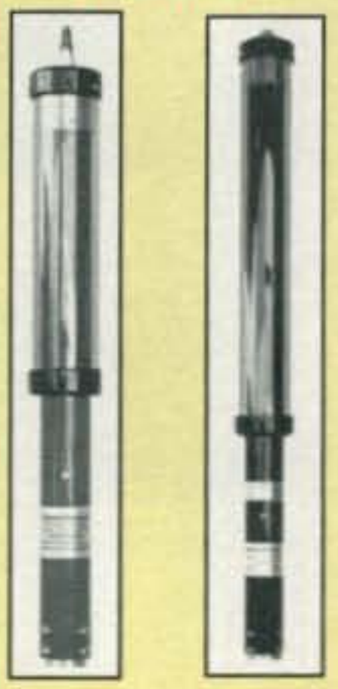

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BY KENT BRITAIN,* WA5VJB

Antenna "Q" in Plain English

Last time I briefly mentioned antenna "Q" and would like to expand on that topic a bit this month. The term "Q," or Quality Factor, has four common meanings in electronics, but we are only interested in the two that apply to antennas at this time.

The first is Q = XI/R. This is the reactance of an inductor in ohms, divided by its resistance in ohms. Thus, if the wire in my coil has a DC resistance of 1 ohm, and at 40 meters has an inductive reactance of 50 ohms, then the Q of this coil would be 50/1, or Q = 50. If I can use a bigger gauge of wire and lower the resistance to 1/2 ohm, then the Q would be 50/.5, or Q = 100.

When it comes to loading coils and traps, Q is good. One of the best ways to get a good Q is by keeping the DC resistance of the coil as low as practical. As a result, a large-diameter wire is the best stuff to use for most loading coils. When it comes to coils by themselves, a rough approximation of Q is the number of times current can circulate before most of it is dissipated (see fig. 1).

In recent years there has been some amazing work done with high-temperature super-conductors. With the DC resistance reduced virtually to zero, incredible Qs in the tens of thousands are possible. Surface roughness and other losses keep the Qs from going to infinity. However, when these inductors are used in filters, they make great front-end filters for cell sites in congested areas. When room-temperature super-conductors become available, there will be a bunch of coil, trap, and antenna designs I'm looking forward to playing with. *(No, I'm not holding my breath until room-temperature super-conductors are available.)*

Another way to increase the Q of a coil is by putting a ferrite core inside the coil. This ferrite core will greatly increase the inductance of the coil without changing its DC resistance. However, ferrite cores can saturate in strong RF fields and are very difficult to design into transmit antennas, so we will be skipping over ferrite loading coils at this time.

Photo A– High-Q and low-Q coils. The bigger the wire, the lower the DC resistance and the higher the Q.

The second way we use Q is bandwidth/frequency. For something like an inverted-Vee on 40 meters, the 2:1 SWR points can be as much as 300 kHz apart. Therefore, the Q of this antenna would be 7/.3, or about 21. On the other hand, for a mobile antenna the usable bandwidth is often only 25 kHz or so. This gives a Q of 7/.025, or 280. For coils (photo A), high Q is good, but for antenna *systems,* high Q is usually bad (fig. 2). Thus, when you are working with your antenna system

*1626 Vineyard, Grand Prairie, TX 75052
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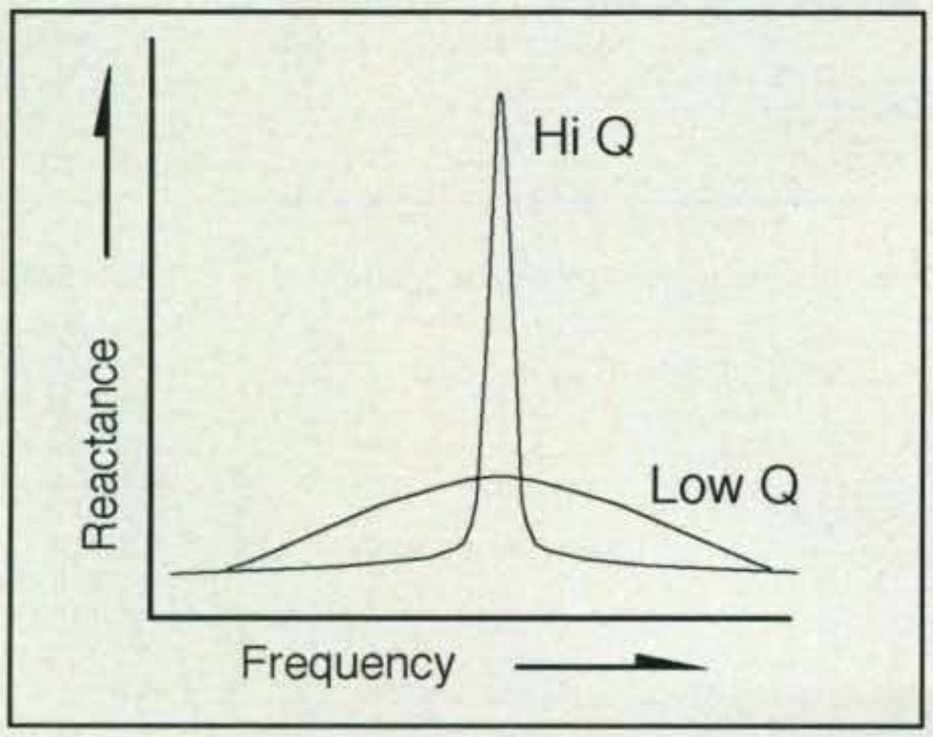

Fig. 1– Plots of low-Q and high-Q coils. A high-Q coil will give you much better performance, but over a much narrower bandwidth.

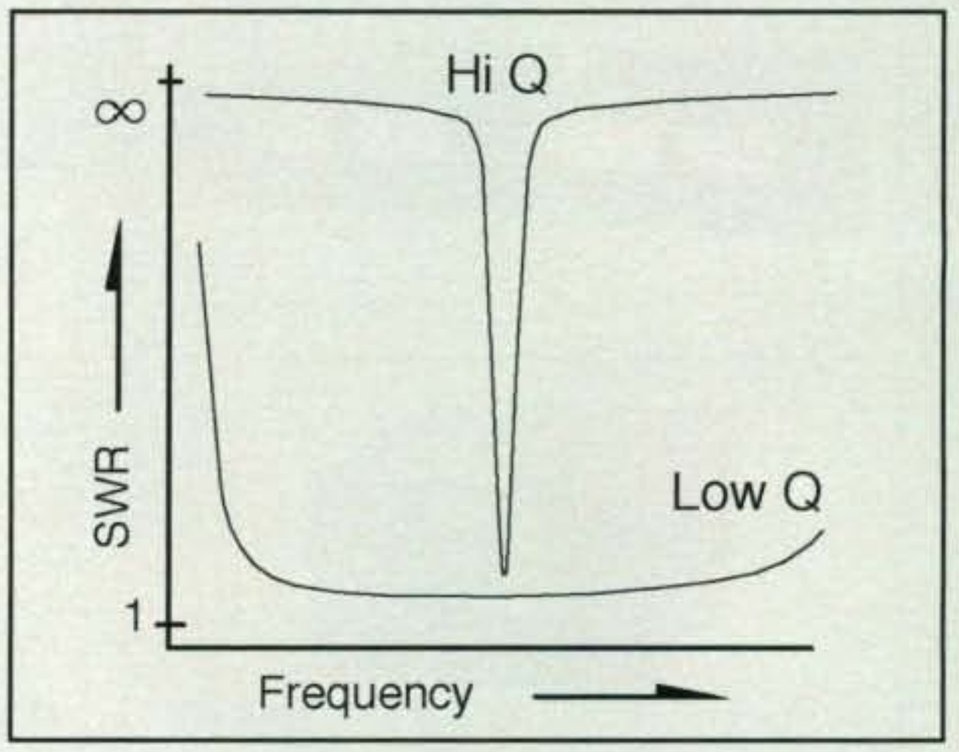

Fig. 2– If your entire antenna system (as opposed to the loading coil) has a high Q, then it will also have a high SWR, except in the very narrow bandwidth for which it is tuned. A low-Q antenna system will give you good SWR over a much broader bandwidth.

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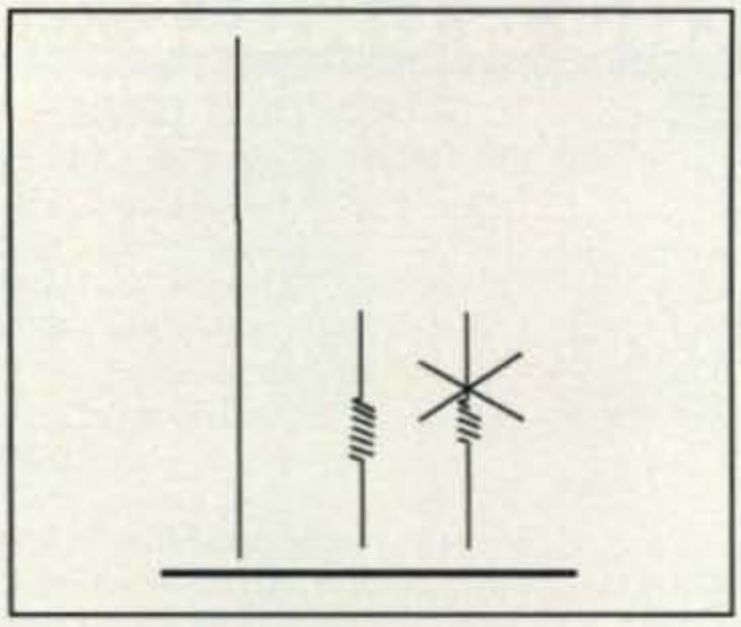

Fig. 3– Three verticals tuned to the same frequency. The first is a straight 1/4-wave whip; the second has a loading coil added to reduce its physical length; and the third has both a loading coil and a capacitance hat to provide greater bandwidth while still being physically smaller than the whip.

and adding a capacitance hat, or improving the ground, and the Q of the antenna goes down, you're doing great. Well, there is one exception here: making the antenna or coax lossy. A dummy load has a Q of 1, but it doesn't make a very good antenna, so watch out for antenna bandwidths that are too good to be true. They usually get that bandwidth by making the antenna lossy.

Capacitance Hats

You often see these big disks (photo B) on mobile antennas. This month we will talk about why someone would go to all the trouble to mount one of these on his antenna, and how it relates to the Q of the system.

In fig. 3 we show three vertical antennas on the same frequency, but two are shortened a bit by using a loading coil. The problem is that you have loss in a loading coil. The greater the loading, the greater the loss. One of the many techniques to help keep these coil losses down is by using a capacitance hat. Note that in the third antenna, the one with the capacitance hat, there is less loading coil. Here's why, and why it's a good thing:

A capacitance hat is a big capacitor, and by putting one plate of a capacitor above the loading coil (the ground is the other plate of this capacitor), the antenna tunes to a lower frequency. This added capacitance lowers the resonant frequency of the antenna. Now there are two ways to move the antenna back on frequency: One, you could shorten the whip. Easy enough, but the efficiency and bandwidth of your antenna are affected by its length. Longer is better! The other way is to remove some of the loading coil. Again there is loss in a loading coil, so by taking out some of the coil, the antenna becomes more efficient. You get out better! The Q of the antenna itself also goes down with the smaller coil, so the operating bandwidth also widens. You can now use more of the band!

Capacitance hats are quite common on mobile antennas, especially among the 160 meter and 75 meter crowds, but you may not notice them on many commercial antennas.

One of our local AM Broadcast stations uses sections of its guy wires as a cap hat. The top 100 feet or so of the guy wires are typical steel guy wire, followed by a section of non-conductive guy wire, then steel guy again down to the ground (see fig. 4). Certainly a couple of insulators could have done the same thing, but I'm sure the tower engineer had a good reason. I tried to photograph their cap hat, but the wires were just too thin for a digital camera to record them.

Photo B– Example of a capacitance hat on an HF mobile antenna.

Tuning Tip

If you have the tunable section of the whip all the way up and it's still not low enough in frequency, a little capacitance hat just might save you the cost of a new and longer whip. You can make your own. We have an example in photo

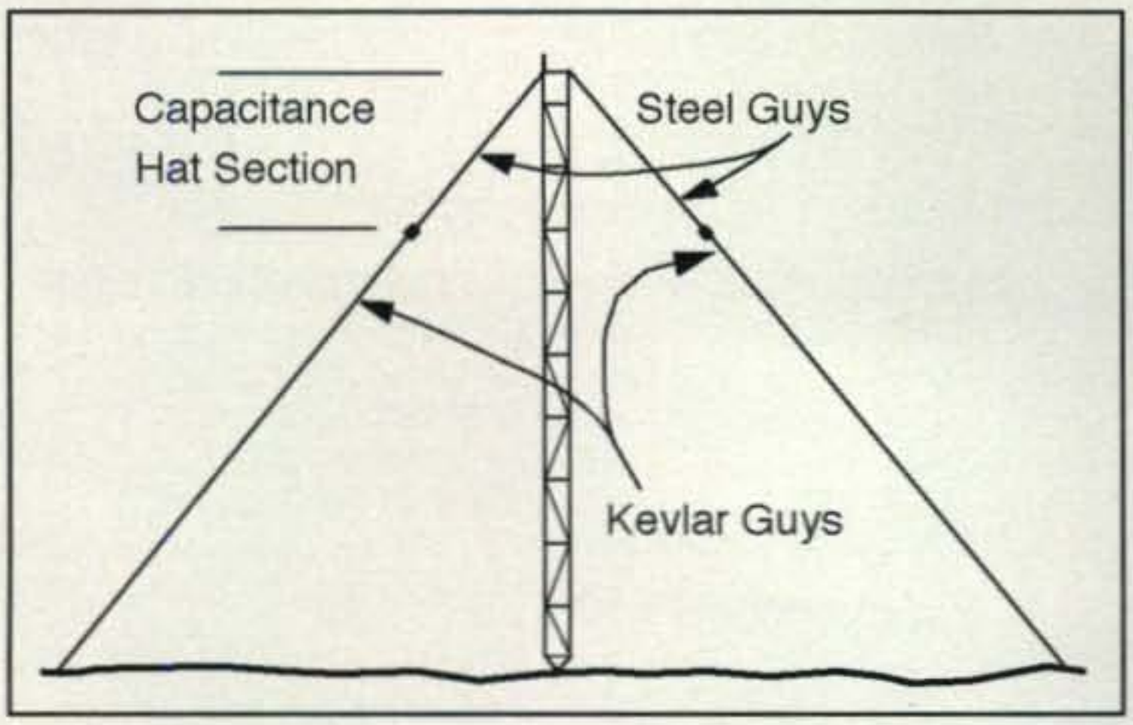

Fig. 4– Here's how a broadcaster used the antenna's guying system as a capacitance hat. (See text for details.)

Photo C– A homebrew capacitance hat doesn't have to be fancy. This one is just a piece of aluminum ground wire held on by a hose clamp. →

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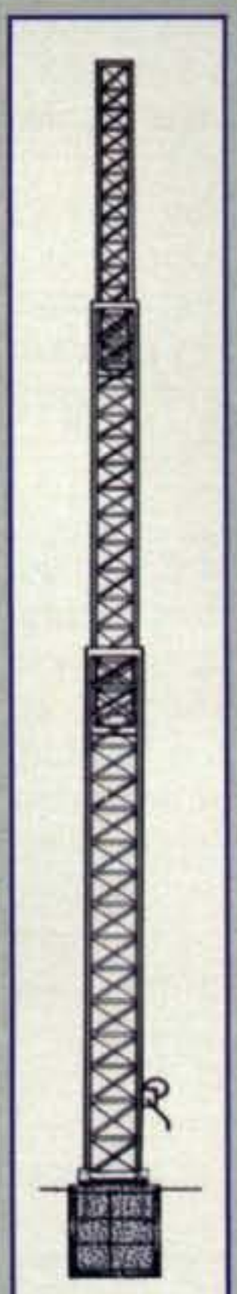

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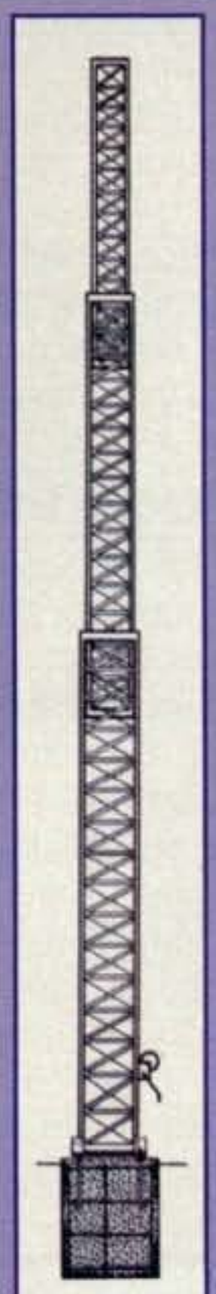

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• MDPL models include motor drive

• Options include coax arms, raising fixtures, masts, motor drives, and more!

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HDX SERIES HEAVY DUTY CRANK-UP TOWERS					
TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
HDX-538	38'	21'6"	600	$1,807	$1,499
HDX-555	55'	22'	870	$3,162	$2,549
HDX-572MDPL	72'	22'8"	1600	$8,281	$6,669
HDX-589MDPL	89'	23'8"	2440	$10,841	$8,699
HDX-689MDPL	89'	23'8"	3450	$20,943	$16,499
HDX-5106MDPL	106'	24'8"	3700	$22,791	$17,549

MA SERIES CRANK-UP MASTS

• Handles up to 22 square feet of antenna load. (See chart below)

• MDP models include motor drive.

• All models supllied with anchor bolts, load-actuated hand winch, and house bracket.

• Options include coax arms, raising fixtures, motor drives, self-supporting and rotator bases, remote control panel, and more!

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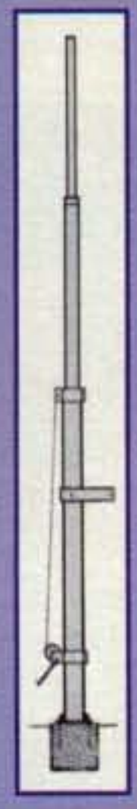

MA SERIES CRANK-UP MASTS							
MAST MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	50 MPH (sq. ft.)	70 MPH (sq. ft.)	LIST PRICE	SALE PRICE
MA-40	40'	21'6"	242	16.5	6.8	$1,209	$999
MA-550	55'	22'1"	435	22	9	$1,875	$1,549
MA-550MDP	55'	22'1"	620	22	9	$3,584	$2,999
MA-770	71'	22'10"	645	15.5	5.5	$3,091	$2,599
MA-770MDP	71'	22'10"	830	15.5	5.5	$4,890	$3,999
MA-850MDP	85'	23'6"	1128	15.3	6.3	$6,591	$5,499

TMM SERIES COMPACT CRANK-UP TOWERS

• Handles 20 square feet of antenna load at 50 MPH, 8 square feet at 70 MPH.

• Compact design is great for areas with tower restrictions, or where a less intrusive installation is desirable.

• All models supllied with hinged T-base, anchor bolts, load-actuated hand winch, 8' steel mast, top plate, and rotor plate.

• Options include coax arms, raising fixtures, motor drives, thrust bearing, remote control panel, and more!

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TMM SERIES COMPACT CRANK-UP TOWERS					
TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
TMM-433SS	33'	11'4"	315	$1,626	$1,349
TMM-433HD	33'	11'4"	400	$1,970	$1,649
TMM-541SS	41'	12'	430	$2,135	$1,789

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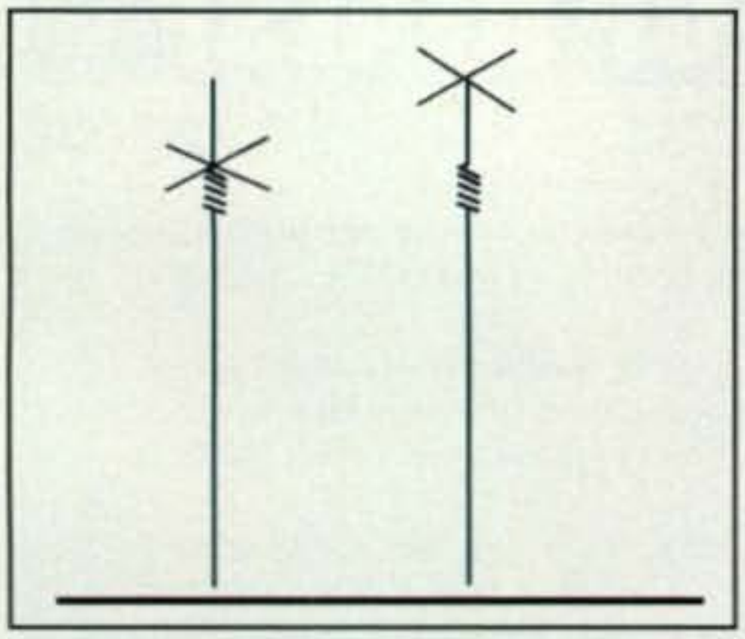

Fig. 5– The best position for a capacitance hat is above the coil. The very top of the antenna is ideal, but difficult to do mechanically, so just above the coil is a good compromise.

C. Just above the coil, mount a section of wire as shown in fig. 5. The capacitance hat needs to be above the loading coil. You can mount it just below the coil, but it works much better above the coil. Putting the capacitance hat on the very top is very good electrically, but can be very difficult mechanically. Aluminum ground-rod wire works well, as does #10 or #12 copper wire.

Make your first guess length a little long, then tweak the antenna on frequency by trimming the ends. As I mentioned earlier, you don't want to shorten the antenna unless you have to. Heater-hose clamps work well to hold your homebrew cap hat in place. The tips are bent around to help keep you from poking yourself in the eye.

Years Gone By

Back in the heyday of CB, a company sold a little ring that was mounted just below the coil of an antenna (photo D). These rings went by a variety of names, including Satellite Ring™, Modulation Ring™, and several similar names. All kinds of advertising claims were made. . . . "Makes a mobile get out like a base station" certainly claims to improve the efficiency of the antenna; "Prevents overmodulation and bleed over" was my favorite. Just how an antenna could cure distortion in a microphone preamp or IF transistor I never did figure out.

Photo D– A CB Modulation Ring™. It may have helped improve an antenna's Q, but it didn't do much in terms of other claims (see text).

However, WB5CPG mounted one to the gear shifter of his MG and said second gear worked much more smoothly!

It was recommended that this ring be mounted just below the loading coil. It would have been far more effective if it had been mounted above the loading coil, but that would have required modification to the loading coil. A more efficient antenna, but a lot of hassle factor. Instead, the antenna stinger, or whip, was shortened a bit. With a shorter antenna, I can't see how this would have helped any. Some manufacturers even tried to call these "ground planes." On 11 meters you need a metal object about 15 feet long to reflect a radio wave. A 6-inch ground plane! Yeah, sure. . . . How about a good deal on Florida swamp land or "used" 2-amp fuses?

Looking Ahead

In the May column we'll talk about using your mobile antenna indoors. Meanwhile, as hamfest season begins, start collecting ferrite beads. There are lots of neat things we can do with them.

Some of my best ideas for columns come from readers' correspondence, so I'm always happy to help with your antenna questions. Just e-mail me at <wa5vjb@cq-amateur-radio.com>. Remember, too, there is just no substitute for a piece of wire in the air.

On the Cover

Bob Wertz, NF7E, of Flagstaff, Arizona, loves to chase DX, especially on 160 meters, but for him, he says, the best part of ham radio is how it has kept his family close.

"My dad was a ham," explains Bob, noting that his father is now a Silent Key. "His call was W9MSC. During the war (World War II), they shut 'em all down and he let his license lapse. Then in 1976, I got my ticket. ... Dad was quite excited when I passed my Novice; he was thrilled about that. Within six months he got his license again; then about a year and a half later, my brother got his license. He's a county hunter."

Bob continues, "This hobby of ours is one of the most satisfying things I've done in my life because of how close it kept my dad and my brother and me, even though we were spread out across the country. ... We used to have coffee every Saturday morning, but I was here in Flagstaff, Dad was in Illinois, and my brother was in Fort Lauderdale."

Bob's ham family doesn't end there. His niece, Bonnie, now has her grandfather's old call, W9MSC, and her husband, Don, is N9OO. Bob is also a creative woodworker. He's built two ham radio whirligigs. The "SSB model," named "Ratchetmouth," is seen in the photo. When the wind blows, the propeller turns and the man's chin moves up and down!

Professionally, Bob owns a Goodyear tire dealership in Flagstaff. His job has no connection with ham radio, he says, "except you can count on *CQ* and *QST* being in my waiting room!" (Cover photo by Larry Mulvehill, WB2ZPI)

Amend License Privileges

Editor, *CQ:*

I read your September 2003 "Zero Bias" editorial on the CQ website, and you asked some good questions that face the U.S. amateur community. You asked, "How will Generals be able to benefit from the changes in other parts of the world?" Can they say the word "upgrade"? If *five years* isn't enough time for them to do this, with the fact that by upgrading they would have an opportunity to work some great DX, then let them stay General.

I upgraded to Extra in 1992 specifically to work DX. I soon discovered after passing my General exam that most of the rare and good DX operated in the Extra subbands. I do not think that Technicians should be upgraded to General without taking that element. You and I had to work very hard for that license, and why shouldn't they? Listen, we've dropped the 13 wpm element, the Advanced element, and the 20 wpm element. How easy do they want it? You do not value that which comes easy. This is the greatest hobby in the world. No one is forced to be a ham, and therefore one should have to meet high licensing standards. We should not sacrifice standards for immediate gratification.

The editor of *Worldradio* magazine, in his September 2003 issue, suggested to his readers that they read the position paper by ZS1AN, "Why we should retain a Morse code requirement for the unrestricted amateur license," and I did. If you have not read this, I hope you do. It's the best pro-and-con position paper on code I have ever read. It is fair and balanced and he backs up his statements with facts. You might want to suggest it to your readers. I went to the QRZ website, typed in his call, and then clicked on the article.

I agree with him in that "licensees who have not passed a Morse code test should not be denied all access to the HF bands. They should have some access to the HF bands." However, as he says, "I believe that this should be done by amending the privileges of the restricted license, rather than removing the Morse code requirement of the unrestricted license." That is the bottom line here. That's where the battle and dividing line will be. There's room under the tent for everybody, but let's not give it away.

What to do with the Novice privileges on 7.100–7.150? If the code requirement is rescinded, then this won't be as much of a problem. But if not, then I propose the following license class band plan: Move the Novice CW band to 7.250–7.300. Move the General band down 50 kHz and let it start at (7.250–7.175); Advanced (7.250–7.150); Extra (7.250–7.100). This way the Generals get a part of the band they have never had before without upgrading, and they would get at least some opportunities to work some great DX. I think the Generals would be happy to give up that upper 50 kHz for this. I know I would! I realize that you can't please everybody, but who can all the time? Leave the Extra CW subband alone. The Extras haven't gotten much out of license restructuring. Giving us the band from 7.150–7.100 would at least be some payback and motivate others to upgrade!!

I would like you to do one thing for your readers. I am a *CQ* reader and member. Please publish how we can communicate through the FCC rule-making process, because there are many of us who would like to voice our opinions properly so that we will be heard.

In closing, 40 meters will become, I believe, the crown jewel of amateur radio. I'm really looking forward to operating on those new frequencies and working some great DX. I appreciate your time.

73, Ray Palmer, KO4RN

Thank you for your comments, Ray. Your views and suggestions regarding the 40-meter subbands should be shared with the FCC at the appropriate time, which will be when (and if) the Commission releases a Notice of Proposed Rule Making in response to requests for eliminating the code exam and, later, for dealing with the international reallocation on 40 meters. Go to the FCC's website, <http://www.fcc.gov> and look for instructions on filing comments on matters before the Commission. (P.S.: The Editor of Worldradio *is Nancy Kott.* He *didn't suggest anything to* his *readers, but* she *did to* hers.*)*

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BY BOB JOSUWEIT,* WA3PZO

Hams Shine in National Emergency Drill

"Our nation must always be ready to face a serious attack, and we must have confidence in our response capabilities," said Homeland Security Secretary Tom Ridge during a briefing on last year's national emergency preparedness exercise, TOPOFF 2. According to Ridge, "We tested our incident management capabilities and pushed the response envelope at the federal, state, and local levels like in no exercise before."

TOPOFF 2 was conducted from May 12–16, 2003 and involved federal, state, local, and Canadian participants in a full-scale exercise that assessed how responders, leaders, and other authorities would react to the simulated release of weapons of mass destruction (WMD) in two U.S. cities, Seattle, Washington and Chicago, Illinois. The exercise scenario depicted a fictitious, foreign terrorist organization that detonated a simulated radiological dispersal device (RDD or dirty bomb) in Seattle and released the pneumonic plague in several Chicago metropolitan area locations. There was also significant pre-exercise intelligence play, a cyber-attack, and credible terrorism threats against other locations. Specific goals of Exercise TOPOFF 2 were to:

- Identify vulnerabilities in the response system;
- Improve the nation's capacity to manage extreme events;
- Create frameworks for the operation of expert crisis and consequence management systems;
- Validate authorities, strategies, plans, policies, procedures, and protocols; and
- Build a sustainable, systematic national exercise program to support the national strategy for homeland security.

The Wilkes-Barre, Pennsylvania area is now being served by a "new" emergency communications vehicle (a 1998 Chevrolet Suburban), provided by a federal grant from the Centers for Disease Control and Prevention, and the expertise of area residents, including several hams. In this photo David Anthony, Leigh Thompson, William D. Harding (KA3QPQ), Richard Arland (K7SZ), and Gregory Berholtz (N3SFO) display their key to the city presented by the Mayor of Wilkes-Barre. (Photo by Patricia Arland)

Communications Overload

As part of the drill, 64 hospitals in Illinois participated in one of the largest mass-casualty exercises ever undertaken. This aspect of the exercise presented an unprecedented opportunity to examine the coordinated efforts of the medical and public-health communities to react to and control the spread of a disease outbreak, specifically an outbreak initiated by a bioterrorism attack. Because of the large number of participating hospitals, challenges regarding communication and the management of resource requirements were significant. The system was not up to the task ... except for one aspect—ham radio.

According to a federal report issued on the exercise, "(c)ommunications heavily relied upon telephones and faxes for data transmission. The unanticipated large call volume was the greatest problem. The phone system in at least one location was overwhelmed, requiring three ham radio operators to maintain communications connectivity."

Larry Langford, a spokesman for Chicago's emergency communications office, indicated the test was designed to press the system to the limit and see if backup systems jumped in. Facsimile communications were also subject to transmission and receipt problems due to call volume. "Blast fax transmissions" took up to two hours to complete. A blast fax transmission occurs when multiple phone numbers are preprogrammed into a fax machine's autodial system's memory and the fax is sent to all of the numbers in the memory one number at a time. In addition, information was often copied manually to a form. The form was then faxed (in some cases degrading its readability) to a collection point, where it was then manually tabulated on another form and then entered into an information system for transmission. This process increases potential errors.

*c/o CQ magazine
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Inside view of Wilkes-Barre, Pennsylvania's new emergency communications vehicle. It includes HF, VHF, and UHF ham gear, along with emergency services radios, a CB rig, and an 800-MHz radio for connection to the statewide emergency network. It is equipped for digital as well as voice communications and has its own generator. (Photo by Richard Arland, K7SZ)

Cortez Trotter, executive director of the Chicago's Office of Emergency Communications, said several "communications challenges" were identified early on in the unprecedented drill and they have already been corrected. Since the drill, the state developed a system called M-net to deal with the problem, Trotter said, "The purpose of it is for hospitals to get away from using analog systems, fax machines, and things that have a tendency to back up when you put in a large volume of information. The alternative to that is for them to be able to sit down at their respective computers and receive real-time data instantaneously over encrypted or secure e-mail systems."

Drills Continue

Local emergency management officials are not resting with just one large drill. Many agencies continue to drill to learn, improve, and be ready to serve at a moment's notice.

The Southwestern Illinois Chapter of the American Red Cross recently proved that practice makes perfect. A drill assessed the chapter's ability to respond to a simulated Level 2 tornado that hit the town of Hame. Nearly half of the town's population, 250–300 people, was affected by the storm which severely damaged over 100 homes and crippled communications outside of the town because of local phone service damage and cellular phone towers being destroyed.

If a disaster were to strike the area, the first thing the chapter would do is send in a damage assessment team in order to evaluate the area. Once the team completed its assessment, a shelter and headquarters would be set up. A family service center would also be established where individuals could have their specific needs met.

At the same time a Mass Care center would be set up. While the damage assessment is happening, other Red Cross staff would also be giving mass care to the people by providing food and clothing.

External Agreements

Most disaster-related agencies cannot do everything by themselves. In many cases they rely on other groups, businesses, and agencies with which they have made agreements as part of their pre-disaster training. These could be contractual agreements with local businesses, school districts, restaurants, amateur radio operators, emergency management officials, and the media. Restaurants would provide meals to displaced individuals. School buildings would be set up as shelters, and local businesses could help by providing locations for family-service centers. Ham radio operators would serve an important role in the disaster relief effort by aiding with communication needs, and the media would help to spread the word on the need for volunteers, financial support, and how the community is being helped.

Trained Teens to Run City EmComm

If a major disaster hits Port Coquitlam near Vancouver, British Columbia, emergency communications will be provided by a group of teenagers. The city's Emergency Procedure Communications (EPCom) team is a super group of 20 amateur-radio-operating teens and six adult supervisors trained to mitigate disaster. EPCom's headquarters is located at the Fire/Rescue's main fire hall. In their operating room, the ham radio operators are surrounded by a large map of the city, computers, and a stockpile of emergency-preparedness gear. The group meets monthly to hone radio-operating skills, make sure the equipment is fine-tuned, and take additional emergency training.

Activation

If the EPCom group is activated, members will check the safety of their own families and then await directions broadcast on AM radio. Most members, depending on their availability, will be dispatched to four main communications rooms in town, such as city hall and the fire hall. Many schools are also equipped with radios. The group is not only trained on how to use amateur radio equipment efficiently, they are also trained to operate on government or business radios. They described communications as fairly similar regardless of the radio used. The key is to prioritize the messages. Chris Carr, VE7BAC, a senior advisor for EPCom, explained that if it was fairly big disaster, they could contact Victoria (Provincial Emergency Program) and get direction. If a dike were about to break, they would radio the public-works department in Coquitlam in search of equipment or assistance. The local assistant fire chief isn't concerned that vital communication links would be in the hands EPCom volunteers. EPCom members have proven that they can take the heat under pressure. Last summer five members of the group were dispatched to help the fire department during severe summer fires around Kelowna. They set up and staffed a shelter and provided a vital communications link. Port Coquitlam Mayor S. W. Young called EPCom a first of its kind in Canada.

Chris Gaube, VA7ACT, a 16-year-old dispatched to Kelowna, said he's pleased with the opportunities he's been given as a member of EPCom. He said that as a youth, working with the fire department and search and rescue is enjoyable.

Amateur Radio—A Vital Asset

As we mentioned above, amateur radio is a vital asset to the local community. Quite often there are comments that there is no funding for amateur radio equipment. Here's one community's solution for a state-of-the-art communications van.

A new $20,000 mobile emergency communications vehicle was placed into service in northeastern Pennsylvania thanks to some well-thought-out grant writing and the inter-

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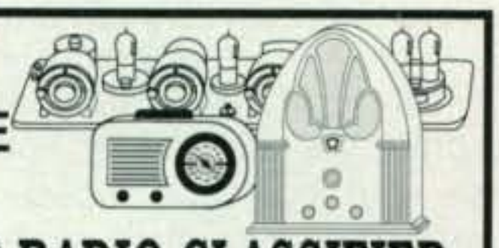

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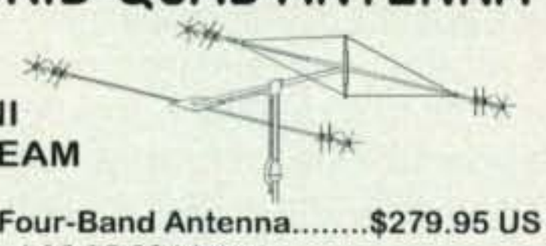

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Virginia drill: John Magda, KB4YFK (standing), receives final pre-departure briefing from the James City County Fire Department prior to deploying into the field from the decontamination station at the county school bus garage with a mobile radiological monitoring team during VOPEX 03. (Photo courtesy Joseph Safranek, K4JJS)

est of a few amateur radio operators active in emergency communications. According to Wilkes-Barre Mayor Tom McGroarty, the federal grant was secured through an unlikely source, the Centers for Disease Control and Prevention in Atlanta, Georgia.

With the financing securely in place, the mayor went to work finding the talent to pull together all the technological elements for the project. Bill Harding, KA3QPQ, the emergency communications coordinator for the city and a volunteer deputy communications coordinator for Luzerne County, was a key figure in that effort.

Harding assembled a team of radio operators who understand the kinds of technology needed to bridge the frequency gaps that keep most municipalities from effectively communicating with one another. The team included Greg Berholtz, N3SFO; Richard Arland, K7SZ; David Anthony; and Leigh Thompson. Arland is the designated communications coordinator for the State Correctional Institution in Dallas, Pennsylvania.

McGroarty secured a used Chevrolet Suburban vehicle for the project, and the volunteer team of radio experts applied their skills and experience to install an array of equipment that will serve to link communities together in times of common emergencies, such as flooding or chemical-weapons disasters. Part of the criteria for qualifying for the grant was installing a second means of notifying the public of an emergency. There was a siren system to notify residents of an emergency. Now the city has added a radio frequency to which residents can tune for emergency notification.

To express the city's appreciation for their volunteerism, Mayor McGroarty presented each member of the team with a key to the city during a ceremony conducted at Wilkes-Barre City Council chambers. At the ceremony the mayor said, "I don't give out many of these. It's only for something special."

Virginia Hams Drill

This past July approximately 20 amateur radio operators affiliated with Virginia Amateur Radio Emergency Service (VA ARES) District 7 participated in the biennial Surry Nuclear Power Plant VOPEX Drill. District 7 is comprised of ham operators from Gloucester, James City, Mathews, and York Counties, and the cities of Hampton, Newport News, Poquoson, and Williamsburg.

Ham radio operators provided backup communications via normal ham radio frequencies on local 2-meter VHF (both voice and digital) nets, as well as an HF voice net and some UHF frequencies. They manned the emergency operations centers in James City and York Counties, and the cities of Hampton, Newport News, and Williamsburg. Other operators were attached to mobile monitoring teams that were dispatched around the area, reporting the exercise input radiation readings back

to the EOCs. In addition, amateur radio personnel were assigned to places such as the decontamination stations, and others monitored/relayed radio traffic from home stations.

During the middle of the exercise, Dave Shantz, KE4ZPZ, had to call the net control station and take his team out of exercise play. He was assigned to a mobile monitoring team with the City of Williamsburg Fire Department, and a traffic accident had occurred at the location from which they were sending exercise inputs. The two fire department personnel on this team immediately took charge of the scene until police and fire/rescue units arrived. Fortunately, no one was injured in the accident and the team was able to return to exercise play.

At the post-exercise debriefing, District 7 Emergency Coordinator Darrell Sutton, KF4HJW, thanked the radio operators for their outstanding support during the exercise. "The men and women of District 7 have once again proven that amateur radio operators are an integral part of the emergency services system," he said. "These volunteer professionals pass essential communications in support of emergency services groups for all levels of government and the community and are available to assist their paid professional colleagues at any time of the day or night. We support state agencies such as the Office of the Chief Medical Examiner, local county and city agencies at emergency operations centers, and other facilities such as shelters and hospitals, as well as field-deployed teams with both voice and digital communications on shortwave or HF, plus VHF and UHF radio frequencies. It makes me proud to be the spokesperson for this group of highly motivated individuals. We stand behind our mottos 'We DO because we CAN!' and 'Preparing today for tomorrow's needs.'"

Are You Prepared?

We've seen how a few amateur radio groups around the U.S. and Canada are actively involved with their communities and train to be ready at a moment's notice. Is your group ready to respond? Does it have a working relationship with local emergency management officials? Tell us your stories. We're always looking for stories of amateur radio serving in the public interest.

This month I want to thank Bill Harding, KA3QPQ, and Joseph Safranek, K4JJS, for their input.

Drop us a note. Until next time . . .

73, Bob, WA3PZO

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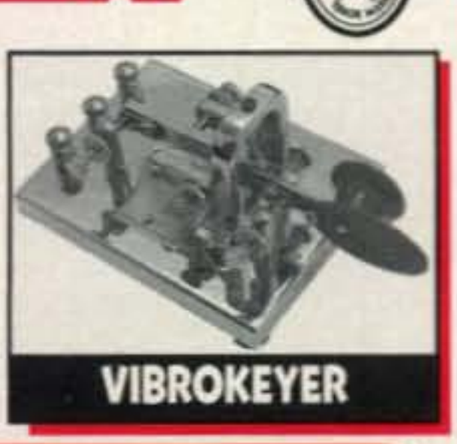
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what's new

BY KARL T. THURBER, JR.,* W8FX

Radio Kits, Hi-Tech Accessories, and more

This month in your "What's New" column we'll focus on some noteworthy hamshack radio gear and accessories, antenna and mobile gizmos, antenna and technology books, and other items we think will be of real interest to you.

Radio Gear

Kenneke Communications New Radio Kits. Kenneke Communications has announced a new line of easy-to-build radio kits. According to proprietor Jon Kenneke, KA7PGB, these affordable kits bring back those fun days of building your own AM, FM, and shortwave radios.

One of Kenneke's most popular kits, the World Band Shortwave Radio Receiver Kit (photo A), lets you build a sensitive radio that allows you to pull in distant stations to "listen to the world." The three-band radio kit also receives local AM radio stations, as well. The kit has a state-of-the-art front end and IF stages that simplify alignment procedures. The kit also includes all parts, wires, and boards, as well as an attractive case. A 9-volt battery and an 8-ohm speaker are required.

Kenneke Communications was founded in 1998 as an internet-based provider of electronics kits and plans. The firm's focus is on affordable and easy-to-assemble products. Other kits offered include AM receivers and transmitters, as well as shortwave, amateur radio, and FM transmitters. A full line of antennas for the kits also is offered.

For more information, contact Kenneke Communications, LLC, P.O. Box 3126, Albany, OR 97321-0702 (541-619-6490; e-mail: <kenneke@kenneke.com>; <http://www.kenneke.com>).

Photo A– The Kenneke Communications World Band Shortwave Radio Receiver Kit is an easy-to-build, fun project that lets you listen to the world. The radio covers three popular radio bands: 535–1650 kHz; 3–10 MHz; and 9.8–28 MHz. See the text for details. (Photo courtesy Kenneke Communications)

Accessories for the Radio Shack

Two New Products from Scientifics®. Scientifics® has introduced two new products of interest to *CQ* readers. One is the new Watts Up? PRO (photo B). It lets you easily calculate the amount of electricity being consumed by appliances and other equipment in your home, office, radio shack, or almost anywhere else. Watts Up? PRO uses sophisticated digital electronics to precisely measure the power consumption of any 120-VAC appliance. It records minimum/maximum watts, power factor, cumulative cost, average monthly cost, and 12 other energy-consumption parameters. Data stored can be downloaded to your PC and turned into spreadsheets and graphs. The $149.95 package includes the device itself, software, a serial-port connector, and instructions.

A second product of interest is the new Scientifics® Solar Rechargeable Xenon Strobe Radio Lantern (photo C). It uses a fold-out solar panel capable of providing three hours of power on the "high" setting per eight-hour charge, and even more on the "low" setting. A full charge requires 30 hours of bright sunlight. The $79.95 device features a four-position switch that includes strobe and audible alarm modes. Other features include an AM/FM radio that also can be tuned to all seven NOAA national weather channels.

Write or call for a new, 100-page catalog featuring more than 2000 scientific and educational products for hobbyists as well as science and engineering enthusiasts. For more information or for a catalog, contact Scientifics®, Dept. A011-C999, 60 Pearce Avenue, Tonawanda, NY 14150-6711 (1-800-728-3999; e-mail: <cons_order@edsci.com>; <http://www.ScientificsOnline.com>).

FocaLite™ Book Compact Multi-Function Flashlight. Imagine-It-Concepts, Inc., has announced its FocaLite™ Book model (photo D).

FocaLite™ Book is a compact, multi-function flashlight with "sunlight quality" light output—ideal

Photo B– The Scientifics® Watts Up? PRO calculator lets you easily calculate the amount of electricity being consumed by equipment in your home, office, radio shack, or almost anywhere else. Watts Up? PRO uses sophisticated digital electronics to precisely measure the power consumption of any 120-VAC appliance. (Photo courtesy Scientifics)

*289 Poplar Drive, Millbrook, AL 35054-1674
e-mail: <w8fx@cq-amateur-radio.com>

Visit Our Web Site

Photo C– The Scientifics® Solar Rechargeable Xenon Strobe Radio Lantern uses a fold-out solar panel capable of providing three hours of power per charge on its "high" setting and even more on the "low" setting. Both strobe and audible alarm modes are featured. (Photo courtesy Scientifics®)

for reading in bed or on an airplane. The super-bright light generated is a focused beam, which means less distraction for others nearby. Provided with a neck cord or clip, FocaLite™ functions as a hands-free book light; there is no need for clipping and unclipping it from the book. You also can clip the device onto your laptop for keyboard lighting without blocking your view of the screen.

FocaLite™ Book comes with five bright-white LEDs and also has a battery-saver mode using only three of the LEDs. The long battery life offers up to 30 hours of service at full brightness. Light output can be adjusted over a 300-degree angle, making it a convenient, hands-free light for working under a sink or counter. The device also functions as an eCandle, without the odor or fire hazard of a regular candle, and also makes a fine addition to your own personal emergency-preparedness kit.

The Book model is compact and lightweight, using three AAA alkaline batteries. The light comes on automatically when the unit is opened, so there is no fumbling in the dark. The device measures $2^1/2$" x $2^7/8$" x $^3/4$" and weighs less than 3.2 oz. with batteries. The LEDs used have a minimum life of over 100,000 hours.

Other, specialized versions of FocaLite™ are available. These include FocaLite™ Auto, especially for mobile map reading and use as a hands-free flashlight, and FocaLite™ Sport, for walking at night, camping, and laptop computer use.

For more information and pricing, contact Imagine-It

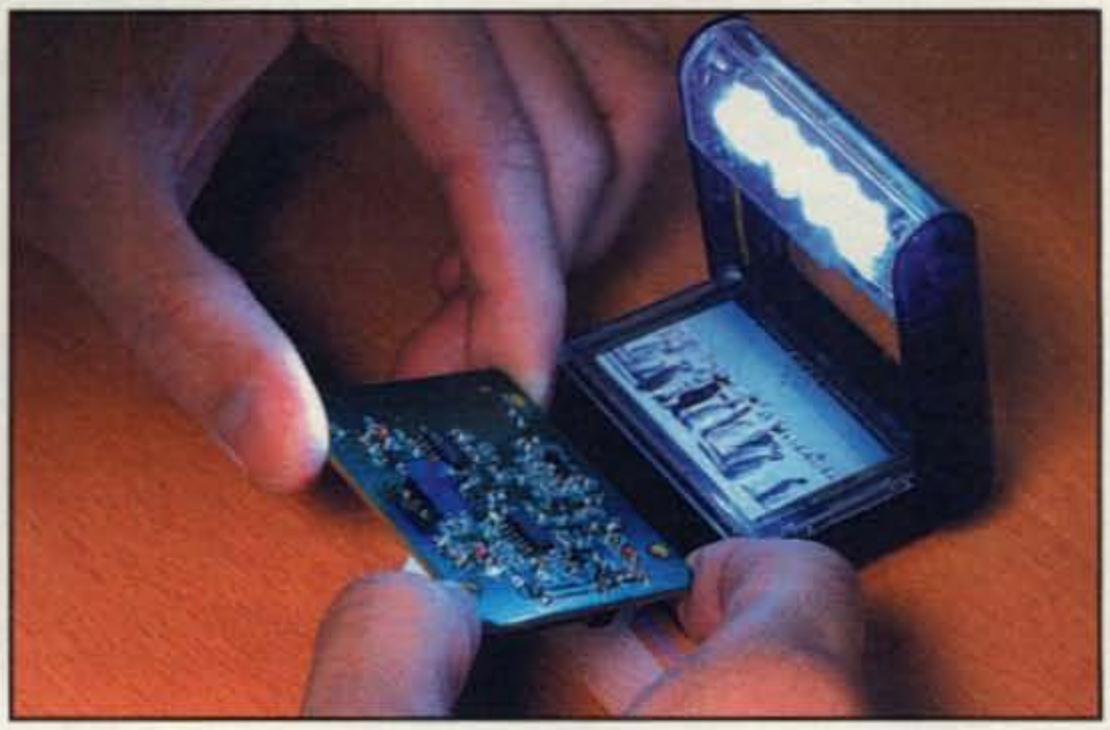

Photo D– Imagine-It-Concepts, Inc., has announced its FocaLite™ Book model. FocaLite™ Book is a compact, multi-function flashlight with "sunlight quality" light output. Other, specialized versions of FocaLite™ are available for hands-free auto and sport use. (Photo courtesy Imagine-It Concepts, Inc.)

Concepts, Inc., 5445 Oceanus Drive, Suite 116, Huntington Beach, CA 92649 (714-899-2068; e-mail: <Sales@imagine-it-concepts.com>; <http://www.imagine-it-concepts.com>).

Antennas and Accessories

MFJ Automatic Antenna Tuner. The new MFJ Automatic Antenna Tuner is a comprehensive package, with SWR/wattmeter, antenna switch, and 4:1 balun included. Designated the MFJ-993 IntelliTuner™ and priced at $259.95, the do-it-all device (photo E) lets you tune any antenna, balanced or unbalanced, automatically and fast.

The exclusive IntelliTuner™, Adaptive Search™, and Instant Recall™ algorithms give you ultra-fast automatic tuning with over 2000 nonvolatile revolving memories. You get a highly efficient L-network at the heart of the tuner, with wide 6–1600-ohm matching at full 300 watts PEP SSB/150 watts CW over the range 1.8–30 MHz. There are cross-needle and digital meters, an aural SWR meter, a backlit LCD display, a remote-control port, a radio interface, heavy-duty relays, and more.

Besides the MFJ-993 IntelliTuner™, two other IntelliTuner™ versions, the MFJ-991 and MFJ-994, also are available. They have specifications generally similar to the MFJ-993, but with somewhat different features and power-handling capabilities. For additional information or for a free catalog, contact MFJ

Photo E– The new MFJ-993 Automatic Antenna Tuner is complete with SWR/wattmeter, antenna switch, and 4:1 balun. Designated the Model MFJ-993 IntelliTuner™ and priced at $259.95, the comprehensive combo device lets you tune any antenna, balanced or unbalanced, automatically and fast. (Photo courtesy MFJ)

Photo F– The Diamond® Antenna MX-610 Duplexer is designed to split HF and 6-meter signals; it's said to be ideal for HF/VHF radios with a single port for HF and 6 meters. The MX-610 allows separate antennas for HF and 6-meter operations on the ICOM 706 series and the Yaesu FT-100. (Photo courtesy Diamond® Antenna/RF Parts™)

Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759 (1-800-647-1800; e-mail: <mfj@mfjenterprises.com>; on the web <http://www.mfjenterprises.com>).

Diamond® Antenna MX-610 HF/6M Duplexer. RF Parts™ has handled Diamond Antenna imports for years and is the exclusive USA distributor for the antennas. Recently, Diamond Antenna /RF Parts™ let us know of a new accessory, the MX-610 Duplexer.

The MX-610 Duplexer (photo F) is designed to split HF and 6-meter signals; as such, it's billed as being ideal for HF/VHF radios with a single port for HF and 6 meters. The MX610 allows separate antennas for HF and 6-meter operations on radios such as the ICOM 706 series and the Yaesu FT-100.

The MX-610 covers 1.3–30 MHz and 49–470 MHz, and it handles 600 watts PEP. Isolation is 45 dB, attenuation is less than 0.25 dB, and VSWR is rated 1.2:1 or better. SO-239 connectors are standard. Amateur net price is $69.95.

For more details, contact Diamond Antenna/RF Parts™ Company, 435 South Pacific Street, San Marcos, CA 92069 (phone 760-7440900; e-mail: <diamondantenna@rfparts.com>; on the web: <http://www.diamondantenna.net> or <www.rfparts.com/diamond>).

Portable and Mobile Goodies

Two Exciting Mobile Accessories from Ameritron®. Ameritron®, along with Hy-Gain®, Vectronics®, and Mirage, is a member of the MFJ Enterprises family. The firm recently announced the Model AWM-35 Flat-Mount Mobile Peak Reading SWR/Wattmeter (photo G). The new device is just $1\frac{5}{8}$" thick, for mounting on your dashboard for easy viewing, or for flat mounting on a wall or shelf in your radio shack. The AWM-35 features a lighted, cross-needle meter.

The new unit, priced at $159.95, handles 1500 watts over the range 1.8–30 MHz, and the electronic circuitry lets you read true peak or average power in either 300- or 3000-watt ranges. The unit includes a remote sensor with a 25-ft. thin, flexible cable that lets you place the sensor and coax out of the way.

Also new is the Ameritron® SDC-100 Digital Screwdriver Antenna Controller (photo H), which tells you exactly where your antenna is positioned. With it, you can retune exactly, fast, and positively,

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Photo G– Ameritron® offers the Model AWM-35 Flat-Mount Mobile Peak Reading SWR/Wattmeter. It's just 1 5/8 inch thick, for mounting on your dashboard for easy viewing, or for flat mounting on a wall or shelf in your radio shack. The unit handles 1500 watts over 1.8–30 MHz, and it lets you read true peak or average power. (Photo courtesy Ameritron®)

Photo H– The new Ameritron® SDC-100 Digital Screwdriver Antenna Controller tells you exactly where your antenna is positioned. With it, you can retune exactly, fast and positively. The SDC-100 works with the Ameritron® SDA-100 antenna, as well as with Tarheel and other screwdriver antennas with a single or dual magnetic switch sensor. (Photo courtesy Ameritron®)

with no guessing. The $79.95 unit has a super-bright, 5/8-inch, four-digit LED display, and a precision microcontroller that gives a digital count range of –999 to +999 (the plus or minus sign tells you if you're going up or down).

The unit also has a large momentary rocker switch that makes up/down antenna control easy, and there's an on/off/reset switch for easy calibration. The SDC-100 works with the Ameritron® SDA100 antenna, as well as with Tarheel

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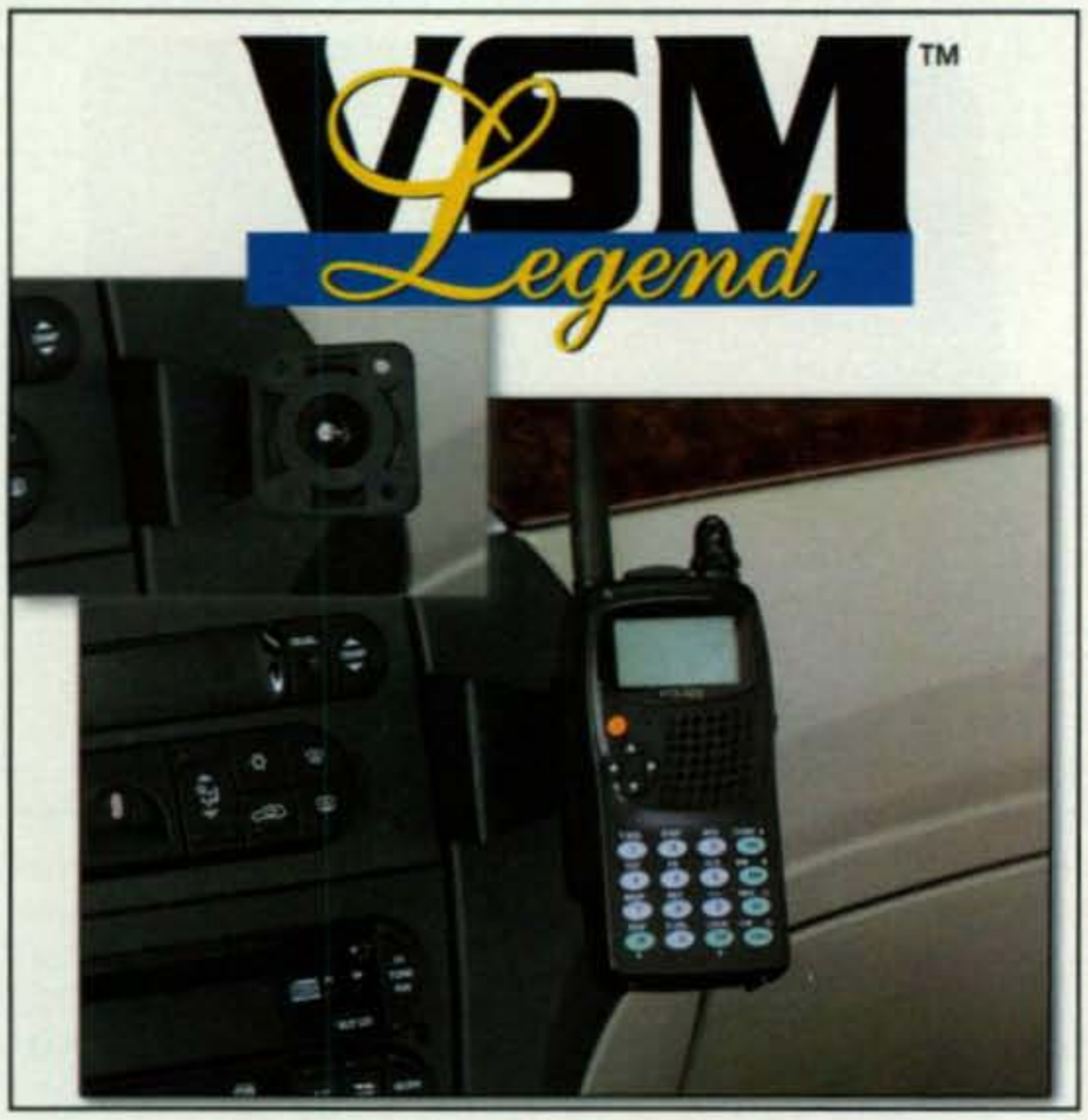

Photo I– Pro.Fit International, Inc., offers the new VSM® Legend series of vehicle-specific mounting (VSM) brackets. The Legend line of VSM®s is smaller, stronger, and more versatile than before, offering a superior mounting platform with no damage to your vehicle's interior, maker says. (Photo courtesy Pro.Fit International)

and other screwdriver antennas with a single or dual magnetic switch sensor.

For more information or a free print catalog, contact Ameritron®, 116 Willow Road, Starkville, MS 39759 (phone 1-800-713-3550; e-mail: <ameritron@ameritron.com>; on the web: <http://www.ameritron.com>).

VSM® Legend Series of Vehicle Mounting Solutions from Pro.Fit. Pro.Fit International, Inc., has announced its new VSM® Legend series of vehicle-specific mounting (VSM) brackets (photo I).

According to Pro.Fit, the Legend line of VSM®s is smaller, stronger, and more versatile than ever before, offering a superior mounting platform with no damage to your vehicle's interior. The products provide a tighter fit to the vehicle dash and become nearly invisible when securing a phone cradle, hands-free accessory, satellite radio, or GPS unit. New to this design is an integrated swivel, which allows adjustments to be made easily with one hand in any direction, up to 30 degrees. The face of the swivel provides a standard "hole pattern" for mounting your electronic device with a clean, professional appearance.

Contact Pro.Fit International, Inc., 1335 Eagandale Court, Eagan, MN 55121 (phone 1-800-388-0073; e-mail: <sales@pro-fit-intl.com>; on the web: <http://www.pro-fit-intl.com>).

From the Bookshelf

Radio Wave Propagation, Volume 1. If you don't have a reasonable knowledge of the behavior of radio propagation, your knowledge of radio has a large hole in it. The folks at antenneX offer a new and fresh approach to learning about this important subject in the new series of books *Radio Wave*

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Propagation, by M. H. De Canck, ON5AU, of Belgium. Volume 1 of the series is now available online and is to be followed by several more volumes.

The author's unique presentation on the subject is not only interesting, but actually makes it a fun learning process. His goal is to explain things in a clear, logical manner to everyone wanting to learn—from the beginner to advanced.

Volume 1 (and the next volumes to follow) provides bonus study aids. In addition to the 220-page Volume 1, with hundreds of illustrations, there also is a companion 129-page study book with 240 more illustrations—a book in its own right. Also included are ten of the unique "Animation Wizard Demonstrators," presenting various informative animations to see propagation in motion. These help the reader visualize the propagation properties explained in the chapters, instead of having to simply imagine the movements of the propagation phenomena.

For more details about this new release and pricing, go to: <http://www.antennex.com/Sshack/prop/prop1.html>. The website is sponsored by antenneX Online Magazine, P.O. Box 271229, Corpus Christi, TX 78427-1229 (1-888-855-9098; e-mail: <info@antennex.com>; web: <http://www.antennex.com>). Be sure to check out the well-designed website, which is replete with ebooks, CD-ROM collections, antenna articles, software, modeling files, and other useful and authoritative antenna information.

Leo Laporte's *2004 Technology Almanac.* New from Peachpit Press, an imprint of Pearson Education, is Leo Laporte's *2004 Technology Almanac.* In this unique volume Leo Laporte and his co-hosts at "The Screen Savers" cable TV show provide a year's worth of anecdotes, tips, factoids, and musings about the machines at the center of our lives. A page is devoted to each day of the year, and each page includes several elements. These typically consist of a single-topic essay (that takes up most of the page) on subjects as varied as ergonomics; so-called "Easter eggs" in popular software programs; processor overclocking; discount-travel websites; hints, tips, and references to lots of worthwhile software; and some admittedly goofy trivia.

As you progress through the year, you'll discover how to keep PC hassles to a minimum while learning something about technology and its impact on society, all delivered with wit and wisdom. The 459-page Peachpit Press book is $24.99.

Before moving on, we should mention that TechTV is the San Francisco-based, 24-hour cable TV network that showcases the smart, edgy, and unexpected side of technology. By creating and delivering insightful programming regarding today's and tomorrow's technology news, events, products, and people, TechTV enables viewers to stay current with all things related to technology. Consult your local TV listings for TechTV programming.

Contact Pearson Education, 200 Old Tappan Road, Tappan, NJ 07675 (1-800-283-9444 or 1-800-922-0579; e-mail: <info@peachpit.com>; on the web: <http://www.peachpit.com>).

Wrap-Up

That's all for this time, gang. Next time, more "What's New." See you then.

Overheard: Regretfully, I've found the hard way that loaned and borrowed tools far too often are lost or misplaced.

73, Karl, W8FX

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BY DAVE INGRAM,* K4TWJ

Microphone Mania 2004

Your response to our "Microphone Mania" columns in the June and July 2003 issues of *CQ* surpassed our expectations and proved that like keys, microphones are true "use and enjoy" collectibles of the best kind. Sincere thanks to one and all. Your appreciation for life's finer treats is admirable! Also like keys, a creditable number of amateurs enjoy restoring and using classic microphones on the air today (typically retro-fitted with new elements and plugs to match modern rigs). Why? It is a great way to spruce up your home, mobile, or portable activities, and every microphone also has its own unique style and appeal (especially those glamorous chrome beauties of the 1960s and '70s!).

In light of the above and thanks to our esteemed guests Bob Heil, K9EID, and Bill Marx, W2CQ, we are proud to feature more microphone views and discussions in both this and next month's column. We sense other audio aficionados and microphone collectors (including folks with only one or two favorite mics) are also reading this column, and we invite you to share photos of your beauties with *CQ* readers. My mailing address is at the bottom of this page. Let's get some well-deserved recognition going your way while preserving more history and views from amateur radio's proud past.

Photo 1– Dazzling, glamorous, and totally awesome suitably describe Heil Sound's professional-grade Heritage microphone. The chrome-plated beauty is specially designed for commercial broadcast use, and it also works great with modern audio-equalizer-equipped SSB transceivers such as the IC-756 Pro, TS-950, and FT-1000. (Photo courtesy Bob, K9EID)

About Our Guests

As many of you know, Bob Heil, K9EID, produces those terrific-sounding Heil microphones you hear on the air in ever-increasing numbers. His enthusiasm for sound enhancement is also reflected in his impressive collection of personally favored mics, a few of which are shown herein (photos 1, 2, and 3). Bob has also been producing one outstanding product after another during recent times. His widely acclaimed Goldline and Classic mics have become familiar items in stations around the world, and now his new professional-grade Heritage model is stealing the show.

The Heritage is a true broadcast-grade mic and a real rock 'n roll masterpiece with a brilliant chrome finish and distinctive "Heil blue" grill cloth that doubles as a built-in wind screen. It sports a marvelous-sounding element with a wide response curve and a slight mild peak around 3500 Hz, and a balanced-output 3-pin XLR connector. An optional prewired cable to match a Kenwood, ICOM, or Yaesu transceiver and a side socket for adding a PTT switch quickly adapt it to your rig. Use your transceiver's built-in audio equalizer for tailoring response to fit your voice and enjoy blow-away good signals. Want more info? Check with Bob or any of the fine folks at Heil Sound at 618-

Photo 2– Yesteryear blends with today and tomorrow as Howdy Doody checks out Heil Sound's new Quiet Phone active noise-canceling headset. Tiny microphones mounted inside each headphone pick up outside noise, which then is inverted 180 degrees in phase and canceled by an in-line differential amplifier. The headset is ideal for noisy areas and multi-op contest stations. (Photo courtesy K9EID)

**4941 Scenic View Drive, Birmingham, AL 35210*
e-mail: <k4twj@cq-amateur-radio.com>

Photo 3– The new Heil Sound PL-2T "squeakless" mic boom with hidden cable channel supporting a Heritage microphone. It is a top-notch boom at a most affordable price. (Photo courtesy K9EID)

257-3000 or <www.heilsound.com>, and also ask about the new active noise-canceling Quiet Phones. They are amazing.

Our other mic-collecting guest, Bill Marx, W2CQ, is also a very interesting chap, and we will tell you about him next month when we feature more of his microphones and have more column space available.

Photo 4– Astatic has always been recognized for its stylish microphones, and this dynamic model 77A reflects that fact in a most impressive manner. It was originally produced to compete with Shure's famous Model 55 "Elvis mic," and like many other Astatics, it gained special favor among radio amateurs. You could definitely work the world with this mic! (Photo courtesy Bill, W2CQ)

Photo 5– This good-looking replica of an Astatic 77A is a Calectro Q4, a very low-cost and tin-can-sounding copy made in Japan during eras past. (Photo courtesy W2CQ)

Mic Talk

Like telegraph keys, which we spotlight annually in this column, microphones typically are judged by their appearance and performance. Also like keys, some interesting tales of special significance are often associated with various styles and models of microphones. Last year, for example, we told you about Shure's big chrome-head mics, which acquired rock 'n roll fame during the 1950s and '60s. Another big name of the day specializing more in public-address and communications-grade mics was Astatic, and many of their mics have also become classic collectibles. As a less expensive alternative to the Shure 55 "Elvis mic," for example, Astatic produced the model 77A (photo 4). Its stylish, big-time appearance gained special favor among radio amateurs using classy AM rigs. A very low-cost "look alike" was also made by a Japan-based company called Calectro (photo 5).

Astatic's history (foothold?) in ama-

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The Z-100 Ultra includes an internal battery pack (with batteries) and circuit mods that allow you to operate the Z-100 Ultra without needing to connect an external power source (but you still can). Nominally, over 10,000 full-tunes and many times more memory tunes before needing to change the long-life batteries. Another W4RT innovation. Really cool for portable operations.

$164: Z-100 Ultra
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* NEW *
DSP for the FT-817

The GAP Antenna Products HEAR-IT DSP Module for the FT-817 now offers you outstanding noise cancellation technology inside your FT-817 featuring 4 levels of noise cancellation, single button operation, low-power consumption, low distortion to audio signal, doesn't interfere with the internal battery pack, can be used with optional filters, including the W4RT One Board Filter.

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The BOSS works great with High Sierra, Hi-Q-Antennas, & Tarheel.

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Photo 6– The ever-popular Astatic D-104 Silver Lollipop. For more than 60 years this magnificent-looking crystal microphone has stood as an instantly recognized symbol of radio communications supreme. It has now been dropped from production and has already become a favorite collectible. (K4TWJ collection)

Photo 7– Prior to discontinuing of a classic, Astatic produced a limited number of these black-and-gold Night Eagle D-104 microphones. They quickly were snapped up by collectors. (Photo courtesy Astatic Company)

Photo 8– The unique-sounding Astatic JT-30 "Bullet mic" was originally designed for public-address use, but it also became a popular amateur radio item. Bob, K9EID, connected a JT-30 to a classic Fender guitar amplifier, introduced it to the Grateful Dead, and it became a top blues and harmonica mic. (Photo courtesy K9EID)

Photo 9– The first reincarnation of Astatic's famous JT-30 microphone was this Shure Model 440. Singers and harmonica players unscrewed its stand and cupped it in their hand, so Shure mounted a volume control in the stand hole and now sells it as a model 520DX. (Photo courtesy W2CQ, owner, and VE3NGW, photographer)

teur radio extends well beyond the flashy model 77A, however, and includes the famous D-104, 10-D, and JT-30. The D-104, or Silver Lollipop (photo 6), was first produced during the 1930s and was discontinued only a couple of years ago. During that 60-plus-year period, an all-chrome Silver Eagle version, a similar gold-plated Golden Eagle version, and (near the end of its life/reign) a black-and-gold Night Eagle version (photo 7) captured the hearts of amateurs nationwide and worldwide. Incidentally, a handheld version with a ceramic element, the D-104 M6, continues on today.

The Astatic JT-30 (photo 8), which was nicknamed the "Bullet mic" due to its shape, also has an interesting history. It originally was produced as a public-address mic. It also gained favor as an amateur radio mic, and its unusual frequency response gave it a distinctive "Wolfman Jack"-type sound. A young Bob Heil was traveling with the Grateful Dead as the sound engineer during that time, so he bought a JT-30, connected it to a classic Fender guitar amplifier with its famous "fuzz sound," introduced it to the band, and the rest is history. The little JT-30 became the leading blues and harmonica microphone. Astatic discontinued production of the little gem a few years ago, but it was reincarnated as a Shure Model 440 (photo 9), which has now become the famous Shure 520DX Green Bullet. What is the difference? The model 440 has a threaded stand mounting hole in its lower area, and the 520DX lacks threads and has a volume control installed in the hole. Look closely at the mic many country and western singers cup in their hand while playing a harmonica, and you will recognize it as a Shure 520DX (unless it's an original JT-30 from a collection!). Truly the Bullet is a unique microphone for a very special application, and it may live on forever.

A few other great-looking microphones of days gone by are shown in photos 10, 11, and 12.

Awesome Audio

Want to command a million-dollar-sounding signal everyone will enjoy hearing? Start with a good (great!) microphone, add a touch of audio equalization to fit your needs or voice, and then set your rig's transmit-carrier injection point to complement the resultant audio response curve. You will sound terrific and improve your on-the-air image by at least 10 dB to boot!

Generally speaking, a good commu-

Photo 10– An interesting spin-off of Astatic's JT-30 is this Turner Model S-22D. The microphone sports a clean appearance with mesh grill, brushed-aluminum finish, and on/off switch, and sounds more natural than a JT-30. (Photo courtesy W2CQ and VE3NGW)

Photo 11– It looks like an Astatic 10-D, and it probably is, but the nameplate reads "DuKane Model 7C40." Investigation revealed DuKane was in the public-address business, but contracted with others for products and simply added its nameplate. There were even Electro Voice mics labeled as DuKane 664s and JBL speakers with DuKane labels. Possibly the only real products DuKane made were nameplates. (Photo courtesy W2CQ and VE3NGW)

nications-grade microphone with a rather limited response curve is an excellent choice. It may not bring out all the low-end bass and bell-ringing highs like Heil's Heritage mic, but it will produce superb audio with maximum intelligibility so you sound better on the air than in person.

Unsure of your microphone's response curve? Check its spec sheet. Look for a 3- or 4-dB rise around 2500 or 3000 Hz; it emphasizes the Ps, Ss, and Ts that add presence to your voice. Borrowing several mics and clip-lead connecting each one to your transceiver for comparison against a known or "reference" microphone also holds merit here.

Since voice characteristics and audio needs vary among individuals, many

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newer model SSB transceivers include a menu-adjustable audio equalizer so you can fine-tune overall microphone response to mate with your voice. You can use it to peak or roll off lows or highs to add glamour for friendly QSOs, or punch for contesting and DXing, and you can also misadjust it and sound dull or flat. Monitoring your actual on-the-air signal (with a separate receiver) is thus necessary to ensure correct adjustments.

In addition to or as an alternative to audio equalization, some modern transceivers also include menu-adjustable transmitter heterodyne oscillators. By slightly shifting the oscillator's frequency, you can move a crystal filter's transmit passband to favor high- or low-pitch tones from a microphone or emphasized through equalization. This adjustment is usually in steps up to –300 Hz and +300 Hz of the passband's center frequency. Check your transceiver's manual or contact its manufacturer's service department for exact details on equalizers and adjustable transmit oscillators.

Tweaking your transmitted signal for optimum results and best on-the-air sound requires mild patience and a good ear for audio. Begin by using a second/ auxiliary transceiver or receiver to monitor your transmitted signal and hear your on-the-air signal exactly like others hear it. Use earphones for close scrutiny, being sure they are full range and do not alter tonal quality of incoming signals. Otherwise your adjustments will be in vain. Can you just punch on and use your transceiver's built-in monitor function here? Not really. It just monitors audio in transmit speech amplifier stages. It does not sample the RF output signal after shaping and passing through the crystal filter.

Connect your transceiver under test (we will call it "A") to a dummy load and reduce RF output to near minimum. Do not connect an antenna to the auxiliary/monitor transceiver (we will call it "B"). Tune both transceivers to the same frequency, and then transmit on "A" while setting RF gain/attenuation on "B" for a receive level between S6 and S9. Now you are ready to begin evaluations and make adjustments.

Begin by studying your regular microphone's sound for reference. If you borrowed other mics, directly compare them for tonal quality, punch, and clarity at this time. Then record equalizer and/or transmit oscillator settings in your log for future reference. Change only one setting at a time, evaluate results again, and then also record

Photo 12– The physical design of this cool art-deco-looking microphone may also have been spun off from the Astatic 10-D and DuKane 7C40. It is a low-cost (and tinny sounding) Argonne M-131 crystal mic made in Japan during the 1960s. (Photo courtesy W2CQ and VE3NGW)

those best/preferred settings in your station's log. This is also a good time to switch your transceiver's speech compressor in/out of the line and determine its best/optimum level or setting. A small amount of compression can boost high tones and add presence plus "talk power." Excessive compression can cause "pumping" or mild distortion. Careful adjustment is the key. Finally, try your new audio mix on the air for a few days, and then repeat the previous procedure to evaluate if your adjustments were ideal or need additional tweaking. Continue making notes on results, continue raising the bar, and enjoy the quest for perfection.

That's all the space we have for this month, gang, but stay tuned for more captivating views and details in next month's column. It, too, promises to be a winner, and we will also show you how to make your very own "Mister Showerhead" mic. Now that's exciting!

73, Dave, K4TWJ

Heath's Early Receivers

BY JOE VERAS,* K9OCO

The airplane business never succeeded in getting the Heath Company off the ground. In fact, its founder and namesake, Edward Heath, was killed flying one of the company's kit airplanes. Howard Anthony, Heath's second owner, died in a private aviation accident as well. With the exception of people such as my friend Bill Pancake, W8SPK, few of this column's readers build and fly their own aircraft. Hams and other electronics hobbyists know the company, instead, for its brilliant Heathkits. Nearly all of us have built or owned a piece of the gear at one time or another.

Heath's first offerings to the electronics market were a combination of World War II military surplus and in-house designed test gear. The test equipment, including a vacuum-tube voltmeter and an oscilloscope, made extensive use of surplus parts that were available in carload quantities at bargain prices in the late 1940s. Heath advertised its goods in electronics, radio hobby, and industry magazines and also issued monthly circulars. It saw radio service shops and independent technicians, especially those learning to work on the new television sets, as fertile ground for its growing line of test gear.

Heath's earliest receivers did little to strongly position the company against traditional amateur manufacturers. In 1948, its monthly flyers and magazine ads included a three-tube regenerative receiver, the K-1. It had an AC power supply and covered broadcast and shortwave bands with two plug-in coils. The kit sold for $8.75 and included everything but a speaker, which added another $1.95. The receiver shown in photo 1 is a K-1 and belongs to fellow Birmingham resident and antique-radio collector Dave Cisco, W4AXL. If you know anything about the K-1 and are able to shed light on the set's enigmatic past, please e-mail me at <k9oco@jveras.com> so I can share the info with Dave.

Photo 1– The first Heathkit receiver was the three-tube, all-wave K-1 regenerative set, initially advertised in 1948. (Photos © Joe Veras, 2004, all rights reserved)

In mid-1949, the circuit was revised slightly and the receiver was re-christened the K-2. It was far from a communications receiver, but Heath's ads called building the kit "a good radio training course." In that sense, it may have served well its purpose and our hobby.

Right on the heels of the K-2, in late 1949 Heath produced the AR-1 kit (photo 2). The six-tube superhet receiver covered the broadcast band

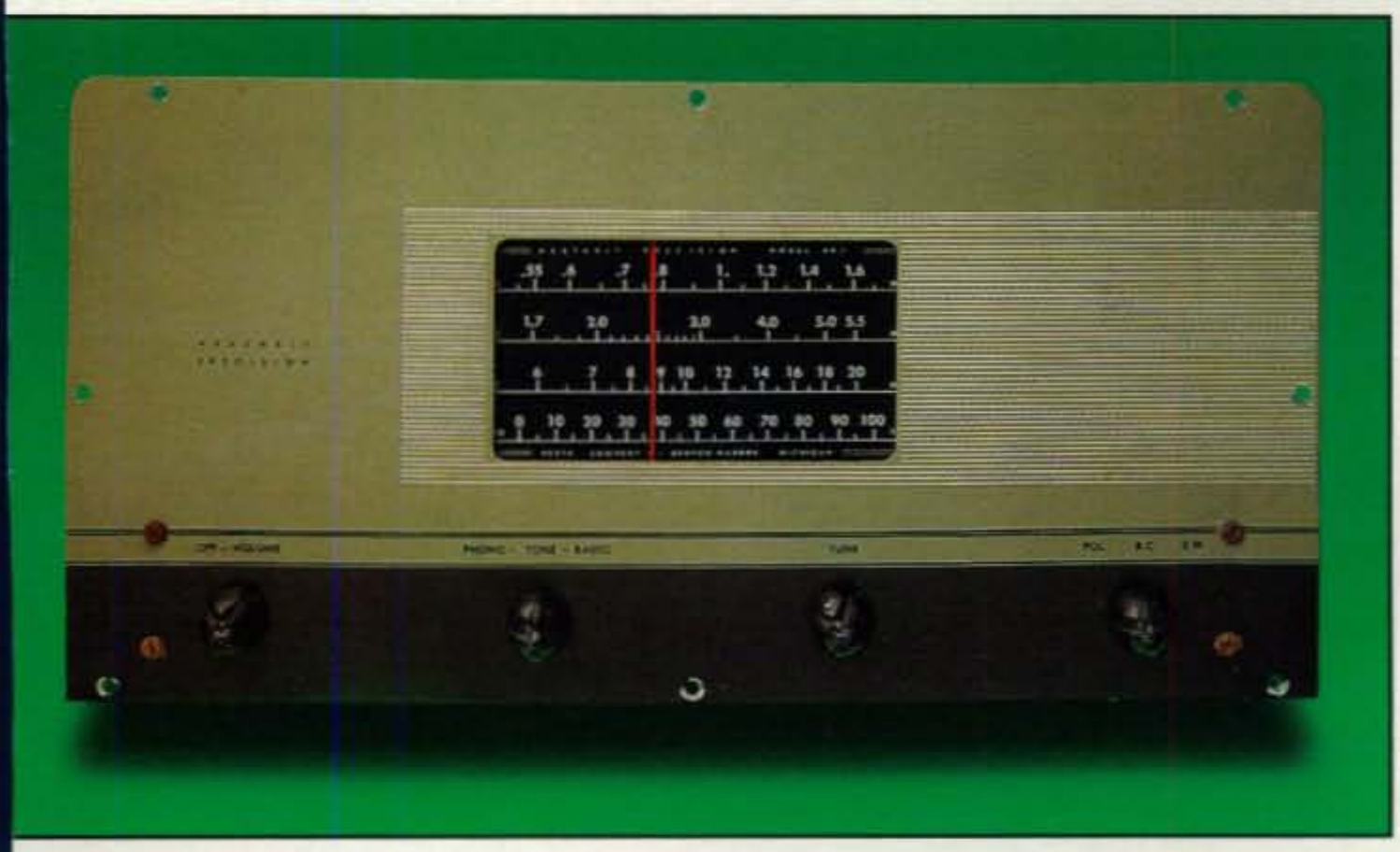

Photo 2– Introduced by Heath in 1949 for the broadcast and casual shortwave listener, some modified AR-1s saw service in hamshacks.

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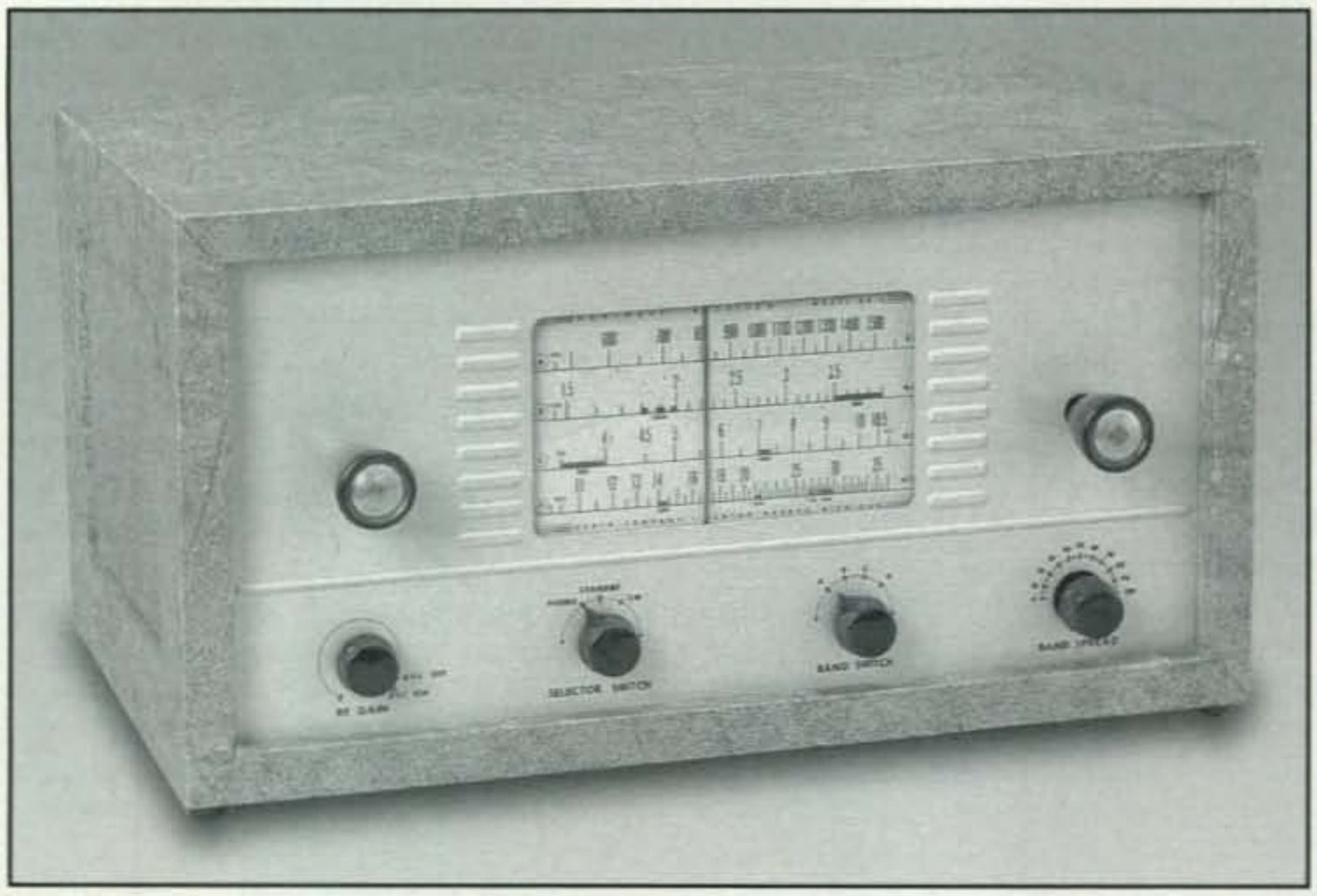

Photo 3– Heath addressed many of the AR-1's obvious shortcomings in an effort to bring an entry-level communications receiver to market when it introduced the AR-2.

and shortwave bands up to 20 MHz. It had a transformer power supply, in contrast to the AC/DC operation found in many other inexpensive receivers. The AR-1's basic $23.50 price did not include the optional speaker or metal cabinet. It also fell short of the mark when counting up the qualifying factors necessary for the designation *communications receiver*.

The AR-1 had no filter in its 455 kHz IF, not uncommon at the lower end of the price spectrum. It lacked a BFO, so it wasn't a CW receiver. The AVC (automatic volume control) couldn't be disabled, which would have been a disadvantage if you *could* have used the AR-1 on CW. I can't think of any more acronyms and initials to throw in right now, but will also mention the receiver's lack of mechanical or electrical band spread. Still, given the AR-1's low price and the good reputation of Heath's products, hams found a way to make a real receiver out of it. A *QST* article in May 1953[1] summarized a few of the most popular modifications and gave detailed instructions for carrying them out.

Adding a BFO required punching a hole in the AR-1's chassis for another octal tube socket. A ready-made BFO coil in a shielded enclosure from Meissner, a switch, and a 12J5 triode, along with a few resistors and capacitors, completed that part of the modification. Band spread was added electrically with a dual-section variable capacitor across the receiver's mixer and oscillator circuits. Additional mechanical band spread was gained by tuning this capacitor with a front-panel-mounted vernier knob. The RF gain control, added to the single IF amplifier stage, was ganged with an SPST switch that disabled the AVC. A headphone jack completed the metamorphosis from *all-wave* set to *communications receiver*.

About the time the article on improving the AR-1 appeared in *QST*, Heath announced a new receiver incorporating its own theories in the Darwin-like process of communications receiver evolution. The AR-2 (photo 3) covered 550 kHz to 35 MHz in four bands and featured a built-in speaker, although the vinyl-covered wood cabinet was still an option. Turning the RF gain control back from its full-clockwise position switched off the AVC, and an impulse-type noise limiter could be turned on if desired. The AR-2 included a BFO controlled by a front-panel *Phone/Standby/CW* switch. The BFO pitch was set internally at the time of construction or alignment. A second variable capacitor paralleled with the main tuning capacitor provided electrical band spread, although its shaft was turned by the use of a very small knob on the lower front panel. The AR-2 added a headphone jack and did away with its predecessor's phono input and tone control, features appropriate for those wishing to use the receiver to amplify a record turntable. The improvements increased the price of the AR-2 only a modest two dollars over the AR-1. The optional cabinet added $4.50 to the kit builder's investment.

Heath's engineers went to their drawing boards and incremented the receiver series once again in late 1955. By spring 1956, the AR-3 (photo 4) was being constructed, one pencil-checked step at a time, by those looking for an entry-level but useful receiver. The new model had fewer tubes than the AR-2, five instead of six. Its designers found a way to use the second detector tube as the BFO, doing away with the separate tube in the earlier circuit. The same 12AV6 tube took care of the noise-limiter function as well. Frequency coverage of the four-band set was slightly different, now ranging from 550 kHz to 30 MHz. The AR-3 still had no filter, but improved IF transformers promised better selectivity, and an antenna trimmer control allowed the operator to peak signals. A rear-panel accessory socket

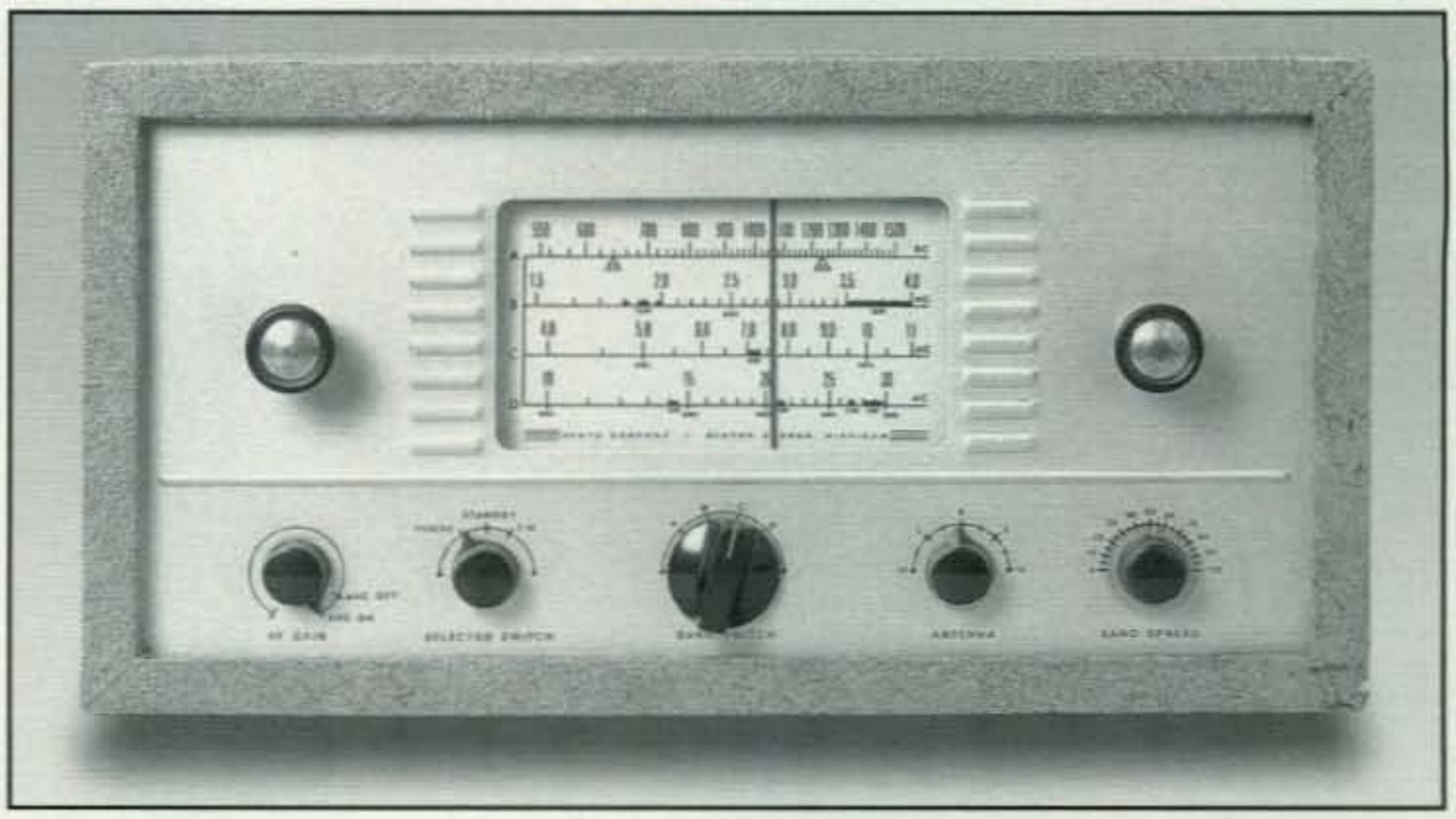

Photo 4– The last receiver in Heath's AR-series, the AR-3, was popular among hams just entering the hobby during the mid- and late 1950s.

provided a way to connect Heath's QF-1 Q-multiplier. It was the first in the AR-line to have an illuminated dial. The basic AR-3 kit cost $27.95, and the vinyl-fabric-covered wood cabinet, with its own aluminum panel, completed the project for an additional $4.50.

I find it interesting that all of the K- and AR-series receivers had transformer-type power supplies rather than the AC/DC setup more commonly found in low-priced receivers. It's certainly more elegant from a design point of view, and an important safety feature, too, given that the sets were often constructed and used by beginners.

Many readers responding to the survey I conducted last fall reported using an AR-3 as a first, or early, receiver. Some commented, euphemistically, they found its performance lacking. While it did not compare with more sophisticated sets, the $25 to $30 Heathkits acquitted themselves fairly well against the modest offerings from major manufacturers . . . none priced lower than fifty dollars. In addition, as Heath pointed out, building the receivers served as a good radio training course. In time those kits would lead to bigger and better performing equipment, a lifelong hobby, or, in some cases, fulfilling careers.

To read more about these receivers and other Heathkits, be sure to see Chuck Penson's book *Heathkit, A Guide to the Amateur Radio Products*.[2] Chuck, WA7ZZE, gives an illustrated tour of Heath's extensive amateur line and also devotes many pages to the Benton Harbor company's history.

Thanks to Dave, W4AXL, for letting me photograph his K-1 as well as sharing his research information on the receiver. Seeing a piece of equipment close up rather than looking at a tiny illustration in a magazine ad is a great experience. The K-1 is a small, but historically significant, part of the Heath family tree. The AR-1, 2, and 3 all belong to Herman Cone, N4CH. Thanks, Herman, for sharing more of your magnificent collection with this column's readers.

In Closing . . .

In December I decided to reclaim my original callsign. It's no longer necessary to have a geographically correct call as it was when I moved to Alabama 30 years ago, so I am K9OCO once again. I'm still getting accustomed to it as of this writing. If you hear me on the bands, please say hello and give me a chance to practice using it. In keeping with the changed callsign, my website, with info on vintage radios and other stuff, is now <http://k9oco.com>.

Classic AM rigs have enjoyed renewed popularity in recent years, and several HF bands have regular gathering places for AM operation. My own interest has turned toward vintage sideband, and current workbench projects are aimed at getting an all-phasing (both transmitter and receiver) station on the air. In the early days of SSB, phasing-type transmitters were numerous, as were receiving adapters. Filter-type sideband generation won out in the end, confining phasing rigs to history and making them a good topic for the next "Radio Classics" column. See you then.

73, Joe, K9OCO

Notes

1. McCoy, Lew, W1ICP, "Modifying the Heathkit AR-1 Receiver for Amateur Use," *QST*, May 1953, pp. 38–41.

2. Penson, Chuck, WA7ZZE, *Heathkit, A Guide to the Amateur Radio Products* (Hicksville, NY: CQ Communications, 2003).

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FCC Considering Future of Broadband over Power Lines (BPL)

BY FREDERICK O. MAIA,* W5YI

In the 21st century will the internet be delivered from your electrical power outlet? And what about its impact on ham radio?

Last year the FCC issued a Notice of Inquiry seeking information on how best to regulate the delivery of high-speed broadband services to homes and businesses using electrical wiring. The inquiry was launched to examine delivery methods of the technology and to explore potential interference issues. "Broadband over Power Line" systems are commonly known by the abbreviations BPL or PLC (power-line current).

The FCC is certainly finding out how the public feels! By the time the public-comment period closed on ET Docket 03-104, more than 5000 comments had been filed by telephone local exchange carriers, amateur radio operators, trade associations/organizations, government and public-service entities, additional spectrum users, and other parties. The sheer volume and tone of the comments makes the BPL proceeding one of the most contentious ever.

The Commission, a big BPL supporter, is looking at the technology as another possible platform for high-speed internet and broadband service to homes and offices. The equipment and installation cost is reportedly far less than for digital subscriber line (DSL) and cable. Also, some electric companies believe they can provide the service to consumers at about half the going rate—about $25/month.

The amateur community is particularly incensed over the FCC's apparent promotion of high-speed internet services over unshielded electric power lines. Last year FCC chairman Michael Powell visited a BPL-enabled home in Maryland and was very impressed with the technology. His belief is that BPL not only has the potential to become the third major broadband pipe into the home, but that competition from electric companies will drive down the prices of cable modem and DSL services.

BPL is Already Allowed

Power-line carrier devices are subject to FCC Part 15 regulations, and current rules already permit BPL. The electric power industry would like the FCC to approve even higher power levels, and the FCC wants to know how the rules might be changed "...to promote and encourage new BPL technology...." Amateur radio, as a licensed service, supposedly is protected from interference caused by unlicensed spectrum use.

Nearly half of the comments were made by amateur radio operators and their organizations, and many were repetitious. Most amateurs told how amateur radio is a valuable public-service resource that must be protected. Mostly unsaid is the havoc that BPL would cause to DXing, contesting, and weak-signal operation.

The American Radio Relay League went all out in an attempt to defeat the measure. It even went so far as to establish a special BPL website advising ham operators what to say in their comments. The League also conducted a technical study—which included field testing—of the interference potential, something that the electrical power industry and its supporters have failed to do so far. Another question that the League wants answered is what happens when an amateur station operates in an area where BPL is deployed and a neighbor's broadband access doesn't work.

"Generalized conclusions drawn about BPL's interference potential in industry comments are premature and meaningless," the League said in its comments. "Overhead power lines make excellent HF antennas." The comments added that the noise potential can be so bad as to totally preclude amateur HF communications "...up to 30 dB over S9."

In total, the comments were more or less predictable. In a nutshell, current users of the HF spectrum do not want the noise level raised, something which is certain to happen if RF signals are injected into the nation's unshielded power lines. Power companies, their organizations, and equipment suppliers want to expand BPL trials and see it as another, potentially lucrative, revenue stream.

Just what is BPL?

Broadband over Power Lines (BPL) is a form of power-line carrier current (PLC) technology whereby data signals are delivered over a building's electrical wiring or radiated from overhead electric power lines running through neighborhoods. It operates on an unlicensed basis under Part 15 of the Commission's rules. Low-power RF energy operating at 2 to 80 MHz in the power lines carries the two-way data communication to the customer's computer.

On paper, the potential of BPL looks great. The technology may be able to provide an additional means for "last-mile" delivery of broadband services, and could enable access to communications services in rural and remote areas of the country—areas where DSL and cable may not be, or may never be, available. In addition, BPL systems can be used by electric utility companies to more effectively manage their electric power networks.

Broadband internet access over electric power lines is something that has been talked about for years. It has now reached the testing phase. Field tests are underway, mostly on the east coast, but none has incorporated interference studies. Companies such as Data Ventures, Inc. (Largo, FL) and Current Technologies (Germantown, MD) are now in the process of commercially rolling out BPL services.

BPL's big advantage is that homes everywhere are already wired for the service, so there is no need for an expensive build-out. The new technology only requires utilities to add certain equipment to their existing wire grids. The key item is a low-cost plug-in power-line modem to separate the data from the electricity.

The technology has been proven to work. The big controversy is over the interference potential. The electric power industry and its supporters say interference has not been a problem, at least so far.

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However, there were virtually no amateur stations located near where these trials have been taking place.

Because the electricity and data signals operate at different frequencies, there is no interference between the two. Since the data signals are distributed at frequencies between 2 and 80 MHz, though, the potential exists for interference to other HF and VHF users of the spectrum. Unlike cable TV signal delivery, the radiation is not contained within a shielded (coaxial cable) environment.

Power-line broadband has another advantage over DSL and cable modem. There is no need to install wall jacks. You simply unplug the power-line modem if you want to move your internet connection to a electrical outlet in another room. BPL data speed ranges from two to four megabytes, faster than DSL and most cable-modem systems.

What the Comments Said

There is significant disagreement among the commenters as to the level of interference that BPL will have on other services. BPL equipment manufacturers and vendors strongly believe in the technology and state that any technical issues, including the potential interference that BPL may have on other services, are "resolvable."

Amateur radio operators, radio astronomers and shortwave broadcasters, and other spectrum users oppose the launch of widespread BPL technology. They maintain that it will cause substantial interference to high-frequency (HF) and VHF spectrum users.

The following is a representative sample of the comments that poured into the FCC's Electronic Comment Filing System (ECFS):

...Jeff Pulver, WA2BOT, President, Pulver.com:

BPL represents an important opportunity to bring the benefits of broadband to consumers, including providing a real alternative to traditional phone service from the local telephone company. As a ham radio operator, I also understand that the American Radio Relay League (ARRL) has raised some concerns that BPL technology may cause harmful interference in the amateur radio bands.

While I cannot speak to all BPL technology, I am familiar with one BPL technology, provided by Current Technologies, that provides a safe, commercially viable transformer-by-pass solution that will truly transform the electric distribution network into a broadband communications platform. Current has resolved transmission issues over both low-voltage and medium-voltage electric distribution lines and has taken the steps necessary to make sure that its technology will not interfere with the ham radio operators living in the areas around their deployment.

Additionally, Current's BPL system leverages the widely accepted HomePlug® standard for power-line communications. My colleagues at the ARRL have already recognized HomePlug® as safe for the amateur radio bands....

...Mike Finnegan, Myrtle Beach, SC:

I live in a captive market where Time-Warner controls cable broadband access. ... Time-Warner's franchise for cable TV should not be allowed to extend to internet broadband services without some fair competition from BPL. ...

...Patrick Mackin, Birminghan, AL

Broadband over power is a wonderful idea, and I will be among the first to subscribe when it becomes available, if the price is lower. On the other hand, I regularly listen to news and cultural programming from around the world on a cheap shortwave radio, and was shocked to hear that broadband over power will have negative implications for radio. I would be greatly disturbed if I could no longer receive this radio programming, and hope that a solution can be reached that would allow both BPL internet and SW radio.

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...Bill Larned, Jacksonville, FL

Alternative BPL systems that use microwave frequencies and have a low interference potential at HF/VHF frequencies have been developed. Microwave frequencies do not have a tendency to radiate omni-directionally for hundreds (or thousands) of miles as HF frequencies do. In addition to low interference, data throughput is higher on microwave frequencies, improving service capability and satisfaction. Please consider changing FCC rules to allow BPL only at frequencies at 2 gigahertz and above.

...Federal Emergency Management Agency, Washington, DC:

FEMA has grave concerns regarding the interference that likely would be caused to Government communications by unlicensed BPL systems. By design, BPL systems use radio frequency energy on unshielded, unbalanced transmission lines, resulting in the unavoidable radiation of RF energy. This unintentional radiation will create harmful interference to licensed radio services throughout the HF and lower VHF spectrum.

FEMA has concluded that introduction of unwanted interference from the implementation of BPL technology into the high-frequency radio spectrum will result in significant detriments to the operation of FEMA radio systems such as the FEMA National Radio System. FNARS radio operators normally conduct communications with signals that are barely above the ambient noise levels.

FEMA believes the FCC should not take actions that would result in any increase in the noise floor in the HF radio spectrum, because any noise increase inevitably would diminish the ability to maintain essential communications. This loss of communication would directly impair the safety of life and property.

...Michael J. Swiatkowski AA9VI, Exeter RI:

BPL is a spurious, dirty method of data transport and the advocacy of such a medium should be halted after reviewing the facts concerning interference to the 3–30 MHz band and harmful interference caused by radiation from a very poor transmission line.

...APCO Frequency Advisory Committee, Saginaw, MI:

The Association of Public-Safety Communications Officials International, Inc. (APCO) is one of several national radio frequency coordination groups which review and help administer license applications. Our committee members, who have years of direct experience in public-safety communication issues and considerable knowledge of the science of radio frequency propagation, believe [BPL/PLC] represents a threat of the most serious nature to public-safety radio systems.

Unlike many other types of interference, BPL/PLC interference generated from the proposed concept represents a 24-hour-per-day, 365-da- per-year threat to a huge portion of the usable radio spectrum.

When our police officers are out in the field, we want to hear them and we want them to hear us. ...The unanimous opinion of our radio frequency administrators is that BPL/PLC will interfere with public-safety radio circuits [and] ...will put law enforcement officers and ordinary citizens at risk.

Southern Company Services, Inc., Atlanta, GA (supplies electrical energy to the southeast):

Neither the ARRL nor the individual commenters provide any technical support for their argument that Access BPL cannot operate in bands used by amateur radio licensees. ...The volume of comments filed by amateur radio licensees is largely reflective of a concerted effort by the ARRL to inflate concern over BPL interference without demonstrated instances of interference or sound technical reasons to believe interference will occur.

...Roger A. Shultz, NJ2R, Caldwell, NJ:

In Emmaus, PA, where BPL has been already been placed into service, many listeners in Emmaus cannot hear KYW-AM 1060 kHz in Philadelphia running 50,000 watts of power. BPL also renders the HF spectrum useless to amateur radio operators within 100 meters of the exposed BPL lines.

...Leonard H. Anderson, WA6HKH, Sun Valley, CA:

None of the BPL advocates contributed anything in the way of quantitative data on their BPL systems' operation nor of any theoretical or actual measured performance data insofar as radio frequency radiation levels. None of the BPL advocates submitted any data as to their BPL systems' configuration, method of operation, or references to other publications containing such information.

Without any technical explanation of future BPL systems and their installation or even of independent agency measurement of an installed BPL system, it is impossible to reasonably evaluate any quantitative data on radio frequency radiation levels that might result. The several millions of Americans who will be affected directly by 1.7 to 80 MHz incidental radio frequency interference will not be satisfied by generalized promises.

Broadband over Power Lines has been described as a "nascent technology." Based on the shortage of technical information on BPL systems, I am tempted to change that description to vaporous technology. FCC regulations cannot be done on vaporware.

...Public Utilities Commission State of California, San Francisco, CA:

Since BPL is very much in its infancy, adequate testing and unbiased field trials should be done to determine and identify the scope of the potential interference that BPL may have on other services, including voice, radio, DSL, and cable-modem broadband services. Furthermore, since there are no industry standards or measurement procedures in place for BPL systems, the FCC should encourage the development of industry standards for BPL, with input from all interested parties, including electric, telephone, cable companies, as well as ham radio operators.

...Potomac Valley Radio Club, Inc., Paeonian Springs, VA:

There are sufficient alternative sources for broadband transport available that do not cause damage to other important services. Moreover, by relying on HF and VHF spectrum, particularly bands currently authorized for use in the Amateur Radio Service, BPL providers will inexorably cause harmful interference to amateur radio communications, either directly or by increasing the ambient noise levels in the amateur radio spectrum. Such detrimental consequences will seriously undermine the ability of amateur radio to fulfill its mandate under the Communications Act as a national volunteer emergency communications resource. That consequence cannot be permitted to unfold.

...Thomas C. Jednacz, W7QF, Dunnellon, FL:

BPL has been rejected in Japan. A study needs to be done to determine why Japan rejected BPL and if those reasons apply to the United States power system. The study should also include European reported interference from BPL systems. Please learn from history. BPL produces interference in other parts of the world. Do not allow it to produce interference in the United States.

...Peter S. Stutman, KL7JT, Sudbury, MA

BPL deployment constitutes RF spectrum pollution on a global basis. Signals generated by the BPL equipment, particularly in the 2–45 MHz range, can easily be propagated around the globe by natural means. Radio amateurs are familiar with propagation of signals around the world in the 2–30 MHz with ERPs measured in milliwatts. Thus, it is quite possible that BPL signals in the U.S. could interfere, for example, with HF communications from a remote African village requesting medical assistance.

...American Radio Relay League, Newington, CT

BPL is a Pandora's Box of unprecedented proportions. Once deployed, the

consumer's expectations will be such as to preclude termination of the service, and interference problems, both to and from BPL, will inevitably be both widespread and impossible to rectify as a practical matter. The Amateur Service cannot be protected from interference from BPL, and BPL cannot be protected from interference from HF and VHF amateur stations. The rules must ensure that BPL is not permitted to operate in or near any amateur radio allocation, and if BPL is permitted at all, any changes in amateur radio allocations must immediately trigger retroactive modifications to BPL facilities to delete any use of amateur frequencies.

...National Telecommunications and Information Administration (NTIA), Washington, DC:

NTIA believes that Broadband over Power Line holds great promise as a new source of innovation and competition in the broadband marketplace. It has the potential to open new avenues of internet access, to enable new and expanded services for utility companies, and to create a new platform for further advances in communications technology. By moving swiftly to examine BPL and to establish appropriate rules for its use, the Commission can provide this emerging industry with a solid foundation upon which to build new services and products that will benefit American consumers and businesses. Thus, NTIA urges the Commission to move forward expeditiously with its BPL Inquiry.

In tailoring its rules to promote BPL deployment, the Commission must be certain to provide all communications stakeholders with adequate protections against BPL emissions that may cause unacceptable radio frequency interference.

...Wireless Communications Association International, Inc., Washington, DC:

Historically, the Commission has believed that a risk of harmful interference may exist up to the tenth harmonic of the operating frequency in question. Accordingly, it is conceivable that Access BPL Systems operating as high as 80 MHz or thereabouts could pose a threat of harmful interference to, among others, licensed wireless broadband service providers in the 700 MHz and 800 MHz bands and license-exempt wireless broadband service at 902–928 MHz.

While there certainly is room for both wireless and BPL broadband systems, the Commission must take care not to create a regulatory scheme that permits the latter to cause impermissible interference to the former.

...The Amherst Alliance (a Low Power FM Radio Service advocacy group), Waterbury, CT:

The generation of signal interference by BPL is an established scientific fact. This interference will erode, and in some places even eliminate, the viability of important established uses on various radio frequencies. In general, small users of shortwave radio are at the greatest risk for serious—indeed, potentially devastating—interference from BPL.

We urge the FCC not to proceed with authorization of BPL transmissions. If authorization is ever granted, it should be done only after: (1) comprehensive testing and evaluation of BPL interference with various radio frequencies; (2) thorough assessment of possible health risks to humans and other living things from exposure to BPL electromagnetic radiation; and (3) to the extent necessary, development and adoption of effective and appropriate countermeasures for the protection of equipment and living things.

...Academy of Model Aeronautics, Muncie, IN

The AMA is concerned that BPL deployment could cause harmful interference to users of RC [Radio Control Service] systems and pose a safety hazard to aeromodeling equipment and spectators. RC modeling flying sites generally are located away from buildings, but many occupy areas adjacent to power lines.

One thing is certain: BPL will raise the ambient noise floor of the radio-frequency environment in which existing services operate. Whether the higher noise floor will be problematic for existing services cannot be ascertained on this record. The true impact will be known only if and when BPL is implemented; but then it will be too late.

...National Association of Broadcasters (And Association for Maximum Broadcasters Service Television, Inc.), Washington, DC:

BPL systems operating in the 1.7 to 80 MH range pose serious risk of interference to television channels 2–5, as well as several stations who are likely to elect lower VHF channels at the end of the digital television transition.

Recognizing the likelihood of interference to existing licensed radio services and to ensure that the public's free over-the-air television service remains clear of any interfering signals, the Commission should limit BPL use to below 50 MHz.

...American Public Power Association, Washington, DC

BPL trials utilizing existing electricity wires have proved that the technology can work. But the trials have not yet demonstrated that there is a best system on technological, cost, performance, or customer preference bases. Flexible rulemaking will allow the marketplace to determine which of the broadband systems will prove to be the winning technologies.

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...HomePlug Powerline Alliance, San Ramon, CA:

Joint testing by ARRL and HomePlug® demonstrated the very low probability of interference between HomePlug devices and amateur radio use. Despite this well-publicized study, many respondents cited potential In-House BPL interference with amateur radio as a significant concern.

The Commission's existing Part 15 rules offer an effective regulatory scheme to protect licensed spectral users while also offering opportunities for innovation by In-House BPL manufacturers and service providers.

...Etón Corporation (shortwave equipment vendor), Palo Alto, CA:

According to the latest research done by the British Broadcasting Corporation (BBC) and the American Radio Relay League (ARRL), BPL threatens to create so much "noise" in this frequency range that shortwave radio, the original operator in this frequency spectrum, would in effect be drowned out. Without any proposed plans or remedies by the FCC to safeguard shortwave broadcasting, BPL poses a real and imminent threat to this medium.

...Radio Amateur Satellite Corporation (AMSAT), Washington, DC:

The BPL industry maintains that no significant interference to licensed services, including amateur, is likely. We urge the Commission to require full theoretical and field-testing studies of potential interference to the amateur and amateur-satellite services, and possible corrective and preventative measures, and to take these studies into account in determining how BPL is to be regulated. As a licensed service, amateur radio is entitled under the Commission's Rules to protection from any and all harmful interference from Part 15 devices such as these.

...United Power Line Council, Washington, DC:

The UPLC encourages the Commission to allow this process to continue so that the industry may continue to improve BPL performance characteristics. The Commission should not require a single spectrum band, modulation scheme, or injection technique.

The fact of the matter is that the Part 15 rules already adequately protect licensees in the bands of BPL operations. BPL operations must comply with radiated emission limits. Field tests indicate that these limits are more than adequate to prevent interference to licensed users. BPL systems operate at extremely low power, and emissions reportedly drop off dramatically as distance increases from the lines.

Who's on Which Side

Comments on BPL generally fell into one of three categories: supporting the technology; urging caution and more study on interference potential; and opposition based on likely interference. Here is a breakdown of groups and agencies (no individuals) cited here and where they stand:

BPL Supporters:
HomePlug Powerline Alliance, San Ramon, CA
Southern Company Services, Inc., Atlanta, GA
United Power Line Council, Washington, DC

Urging Caution Regarding Interference:
American Public Power Association, Washington, DC
IEEE Power System Relaying Committee, Oakbrook Terrace, IL
National Academy of Sciences' Committee on Radio Frequencies, Washington, DC
National Association of Broadcasters (And Association for Maximum Broadcasters Service Television, Inc.), Washington, DC
National Rural Electric Cooperative Association, Arlington, VA
National Telecommunications and Information Administration (NTIA), Washington, DC
Public Utilities Commission State of California, San Francisco, CA
Radio Amateur Satellite Corporation (AMSAT), Washington, DC
Wireless Communications Association International, Inc., Washington, DC

BPL Opponents:
Academy of Model Aeronautics, Muncie, IN
APCO Frequency Advisory Committee
ARRL (American Radio Relay League)
Etón Corporation (shortwave equipment vendor), Palo Alto, CA
FEMA (Federal Emergency Management Agency)
Potomac Valley Radio Club, Inc., Paeonian Springs, VA
The Amherst Alliance (a Low Power FM Radio Service advocacy group), Waterbury, CT

...National Academy of Sciences' Committee on Radio Frequencies, Washington, DC:

The emissions that radio astronomers study are extremely weak – a typical radio telescope receives less than one-trillionth of a watt from even the strongest cosmic source.

Radio astronomers are particularly concerned about the potential for the generation of harmonics of the broadband radio signals. We urge the Commission to maintain at the very least the level of protection currently provided under Part 15 for the Radio Astronomy Service (RAS).

...IEEE Power System Relaying Committee, Oakbrook Terrace, IL:

Additional investigation on how BPL can be applied without causing interference to existing services must be explored. The ARRL has demonstrated that it is possible through spectral masking to eliminate interference to the Amateur Radio Service. Changes must be made to Part 15 so that broadband signals, having low signal level at a given frequency, can be evaluated under consistent means regardless of the manufacturer or power system.

...National Rural Electric Cooperative Association, Arlington, VA:

We urge the Commission to allow BPL deployment but to refrain from establishing new rules, or relaxing existing rules, until it is determined with confidence that interference can be limited to acceptable levels. While broadband over power line is promising, much more information is needed before it can be determined with confidence that BPL will be a viable broadband platform for rural America.

Without conclusive evidence of unacceptable performance, BPL deployment should not be banned or severely restricted, because BPL may prove to be a viable broadband solution in certain circumstances.

What's Next?

Now that all the comments have been filed on the Notice of Inquiry, the next step for the FCC would be to issue a Notice of Proposed Rule Making, or NPRM, suggesting new rules based on the comments and other developments in the field since the Notice of Inquiry was released (alternatives such as using frequencies in the microwave spectrum or wireless Metropolitan Area Networks for the connection to the consumer's equipment). There is no time frame at this point as to when—or even whether—the FCC proceeds to that next step, although the *Tampa Tribune* newspaper quotes Fred Thomas, Chief of Staff of the FCC's Office of Engineering and Technology, as saying he expects an NPRM will be issued by March or April of this year.

It's clear that with federal agencies such as FEMA, NTIA, and the National Academy of Sciences, and industry groups such as APCO, NAB, and IEEE all weighing in with strong cautions about interference potential, the FCC will not be able to simply ignore these concerns first brought to light by hams. 73, Fred, W5YI

vhf plus

BY JOE LYNCH,* N6CL

The First EBBE QSO

The first-ever Earth-Balloon-Balloon-Earth QSO took place on December 6, 2003 at 1619 UTC between Harry Mueller, KC5TRB, in Oktaha, Oklahoma, and Justin Adams, KD5EAG, in Norman, Oklahoma. The ground distance between the two stations was 127 miles. The QSO was made possible by the dual launches of the DART-1 balloon at the National Weather Service in Norman, Oklahoma and the ORB-7 balloon in Tulsa, Oklahoma, at approximately 9:25 AM local time (1525 UTC). The launches were coordinated via cell phone so as to be nearly simultaneous. The DART-1 repeater was on 145.720 MHz and the ORB-7 repeater was on 145.750 MHz, and the between balloons frequency was 446.590 MHz.

During the flights, several QSOs were completed using the onboard repeaters. The Midwest City (Norman) group is called Deployed Amateur Radio Technology (DART), headed by John Robbins, AD5GT, and the DART-1 balloon was their first launch. The Tulsa group is headed by Harry Mueller and the ORB-7 was their seventh launch.

For details of the ORB balloon launches, see <http://www.gbronline.com/harrymue/ORB>.

ISS May Be QRT Temporarily

Beginning next month the International Space Station may be off the air temporarily insofar as amateur radio operations are concerned. Due to a "temporary medical issue" affecting Bill McArthur, KC5ACR, astronaut Leroy Chiao, who is not a licensed amateur radio operator, has replaced him on the Expedition 9 crew. Chiao will join Russian Valery Tokarev, who also is not a licensed radio amateur. Speculation is that Chiao could become licensed before his mission begins, but there is no assurance at this time that he will do so.

According to NASA Astronaut Office Chief Kent Rominger, NASA plans to assign McArthur to another ISS crew increment. However, it is unknown at this time when that increment will begin. Also unknown is who will be part of Expedition 10. Chiao, NASA Space Station Science Officer John L. Phillips, and Flight Engineer Salizhan S. Sharipov had been scheduled to be part of this expedition crew before the loss of the *Columbia* shuttle a year ago last month. However, with Chiao being bumped up to Expedition 9, someone would have to replace him on the Expedition 10 crew.

Considering that each Expedition crew's tenure is approximately six months, it is possible that Expedition 10 would be a full three-person crew and the first transported by a shuttle since the disaster. If this is the case, it could be that at least one of the crew would be a licensed ham radio operator, possibly even McArthur, should his health issue be resolved by then.

*e-mail: <n6cl@fuller.edu>

VHF Plus Calendar

March 6	Full Moon
March 6–7	DUBUS EME Contest First Weekend. (see text for details)
March 7	Good EME conditions
March 12	Moon Perigee
March 13	Last Quarter Moon
March 14	Very Poor EME conditions
March 19-20	Tulsa Green Country Hamfest (see text for details)
March 20	New Moon and Vernal Equinox
March 21	Moderate EME conditions
March 27	Moon Apogee
March 27-28	DUBUS EME Contest Second Weekend (see text for details)
March 28	First Quarter Moon. Very Poor EME conditions.

—EME conditions courtesy W5LUU.

It is unfortunate that this crew change has occurred at this time, considering that before the discovery of the air leak in late December, amateur radio communications with the ISS had been enjoying a resurgence in popularity after the start of Phase 2 amateur radio operations onboard the ISS. By mid-January amateur radio operations had been cut back, as the crew was spending more of its time looking for the leak. For more information on the technical aspects of the rollout of Phase 2, see "Amateur Radio on the International Space Station—Phase 2 Hardware System," by Frank Bauer, KA3HDO, et al., in the Winter 2004 issue of *CQ VHF* magazine.

New 50-MHz Meteor-Scatter DX Record

The December *Geminids* meteor shower has produced a new record distance for meteor-scatter operations on 50 MHz. During the shower, Bob Mobile, K1SIX, in FN43ad, worked Dave Robinson, WW2R, in EM13qd, for a new record of 1502 miles.

Current Contest

The **European Worldwide EME Contest 2004.** Sponsored by DUBUS and REF, this contest is intended to encourage worldwide activity on moonbounce. Multipliers are DXCC countries plus all W/VK/VE states/provinces. This gives an equal chance for stations from North America, Europe, and Oceania. The rules reward random QSOs, but do not penalize skeds on 2.3 GHz or above.

1. Contest Dates and Bands: First weekend—432 MHz, 2.3 GHz to 5.7 GHz, 6–7 March 2004, 0000 to 2400 UTC. Second weekend—144 MHz, 1.3 GHz and 10 GHz, 27–28 March 2004, 0000 2400 UTC.

2. Sections and Awards: QRP—144 MHz <100 KW EIRP; 432 MHz <400 KW EIRP; 1296 MHz <600 KW EIRP; >= 2300 MHz no separate QRP/QRO categories; QRO on 144, 432, and 1296

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MHz, stations with EIRP equal to or greater than stated above. PRO non-amateur equipment or antenna: PRO stations will have scores listed separately. There are no separate multi-operator classes. Multi-operator and QRO stations will be highlighted in the general classifications. All QRP/QRO band winners and QRP/QRO multiband winners will receive a year's free subscription to *DUBUS* magazine. In each band/section, certificates will be sent to the top ten entries and to the highest-scoring station in the southern hemisphere.

3. Contest Exchange: For a valid QSO, both stations must transmit and receive both callsigns + TMO/RST + R. During a QSO, on any band, liaison by any other means (for example, DXcluster, internet, telephone) is forbidden. There is no restriction on modes, but entrants must not cause inter-mode QRM.

4. Logs: Logs must be separate for each band and should be in normal "logbook" format. Top line: Your callsign, Band Each QSO, Date/Time, Callsign, Report sent, Report received, Points, Multiplier. Bottom line: Total points, Total multipliers, Total claimed score.

5. QSO Points: 100 points for each random QSO completed; 10 (ten) points for each sked QSO completed on 144/432/1296 MHz; 100 points for each random or sked QSO completed on 2.3 GHz or higher bands.

6. Multipliers: Each DXCC country (except W/VE/VK), or *each individual state* worked in W/VE/VK. Multipliers count only if worked by *random* (except on 2.3 GHz or above). States and provinces can be determined after the contest using recent newsletters, on the web, or in *DUBUS*.

7. Total Scores: Single band score = [Total of QSO points] × [Total of multipliers]. There will be one QRP winner and one QRO winner on each band. Multiband score = [(Total sum of points on 144–1296M Hz) + (2 × total sum of points on 2.3 GHz or above)] × [Total sum of multipliers on all bands]. There will be one QRP multiband winner and one QRO multiband winner. Multiband stations will also be listed as an entry on each separate band worked and can also win single-band awards.

8. Contest Entries: Copy of the log for each band with details of points, multipliers, and total points. The following information *must* also be included for each band: (1) Output power, transmit cable loss, antenna type and gain; (2) Category: QRO/QRP single/multi operator; (3) Name(s) of all operators. (4) Locator/State. Other info is welcome: comments, conditions, locator, station details, photographs, etc.

9. Contest entries *must* be sent no later than 30 days after the end of the second weekend (i.e., in the mail or e-mail by 30 April 2004). Mailing address: Patrick Magnin, F6HYE, Marcorens, F-74140 Ballaison, France. You may also e-mail your contest entry in ASCII format to: <f6hye@ref-union.org>. All e-mail entries will be acknowledged within one week.

10. Referee: N.N.—For rules and general questions contact: <info@ dubus.de>. Please note: Do *not* send logs to G3SEK, and do *not* send logs to any *DUBUS* post or e-mail addresses.

(For REF: Patrick Magnin, F6HYE, and for DUBUS: *Joachim Kraft, DL8HCZ)*

Calls for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' *Proceedings*, or both. For

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The December 6, 2003 record-setting launch of the ORB-7 balloon. (W5OKL photo)

A subdivision in northeast Oklahoma. This photo was taken by the pen cam on board ORB-7 balloon's payload.

more information, questions about format, media, hardcopy, e-mail, etc., contact the person listed with the announcement. To date this year the following organizations or conference organizers have announced calls for papers for their forthcoming conferences:

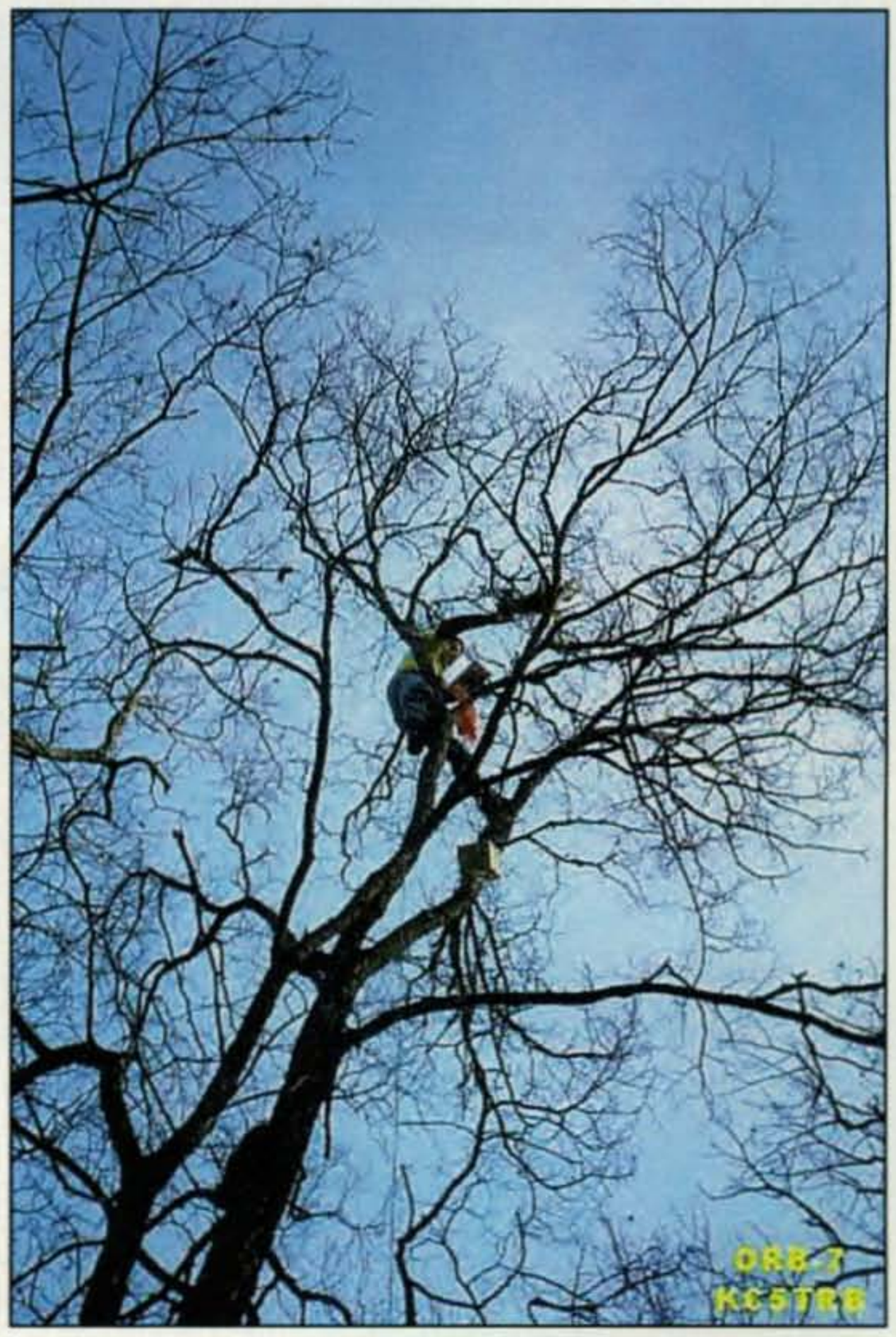
The **Southeast VHF Society Eighth Annual Technical Conference** will be held on April 23–24 (see announcement later on in this column). Contact Ray Rector, WA4NJP. Ray's e-mail address is <wa4njp@bellsouth.net>. The deadline for submitting papers is as soon as possible.

The 38th annual **Central States VHF Society Conference** will be held July 22–25 at the Delta Meadowvale Resort and Conference Centre in Mississauga (Toronto), Ontario, Canada. The deadline for submitting final papers is May 1. Submit proposals as soon as possible to Bob Morton, Technical Chairman and V.P., at <ve3bfm@csvhfs.org>.

The 11th **International EME Conference** will be held on the campus of the College of New Jersey, in Ewing, NJ, August 6–8. Submit proposed paper/talk topics as soon as possible to Marc Franco, N2UO, <eme2004@qsl.net>.

Current Conferences and Hamfests

The **Tulsa Green Country Hamfest** will be held March 19–20 at the Claremore Expo Center, Claremore, Oklahoma. Touting itself as the largest hamfest in Oklahoma, it has been well attended and well supplied with dealers, and representatives from at least one manufacturer. Your editor will have a booth, selling the current issues of *CQ* and *CQ VHF* mag-



Harry Mueller, KC5TRB, up in the tree to recover the payload of the ORB-7 balloon. (KC5TRB photo by KD5JXU)

azines, as well as other CQ products. Hopefully, we will have our specially outfitted radio-controlled Hummer® on display. Admission is just $10 at the door. For more info and a printable flyer, see <http://www.greencountryhamfest.com/pdf/Flyer_2004.pdf>.

The **Joplin ARC Hamfest** is scheduled for April 9–10, at the John Q. Hammon's Trade Center located off of South Range Line in Joplin, Missouri. It is easily located off Exit 8B from I-44. Your editor is scheduled to give a talk on VHF and also expected to have a booth at the hamfest. Also, at the nearby Ramada Inn will be the first **OzarkCon 2004** QRP conference. In years past it has been known as the ArkiCon conference and was held in conjunction with the Ft. Smith, Arkansas hamfest. However, this year it is being held in a more central location for the four-state area of Arkansas, Kansas, Missouri, and Oklahoma. While most of the QRP talks are related to HF operation, a growing number of participants are discussing QRP on the VHF and above ham frequencies.

For more information about the Joplin ARC Hamfest, go to <http://www.joplin-arc.org>. For more information on OzarkCon 2004, go to <http://www.ozarkcon.com>.

The **Southeastern VHF Society** will sponsor their **Eighth Annual Technical Conference** in Atlanta, Georgia April 23–24. Amateurs from all over the southeastern United States and beyond will meet to learn and teach VHF operating techniques and skills for the bands 50 MHz and above. The conference provides a forum for presenting technical papers on a wide range of topics covering everything from microwave building techniques, to using modern digital modes to communicate by bouncing a signal off the ionization trail left behind by a meteor burning up in the atmosphere, and more.

Conference activities include technical presentations, pre-amp noise figure session, and antenna gain measuring competition. On Friday, April 23, they will have a new Kick-Off Luncheon with guest speaker Gene Zimmerman, W3ZZ, *QST*'s "The World Above 50 MHz" editor. There will also be the popular Backscratcher Antenna Competition. At the banquet in 2002, they gave out backscratchers, a promotional item from Mouser Electronics. The idea came up to use the backscratcher as an antenna boom for 1296 MHz. The idea caught on, with nine designs submitted for this past conference. Tom Reddeck, W4VHH, won the 2003 competition, getting 12.54 dBi gain from a 17-inch long backscratcher boom with seven elements! At the conference in April 2004, the Backscratcher Antenna Competition will be for 2304 MHz.

A major new activity for their 2004 conference will be the Southeastern VHF Society/Mini-Circuits Annual Award for Design Achievement. Harvey Kaylie, president of Mini-Circuits, has offered to sponsor this electronics design competition to encourage advancement in the state of the art in circuit design on VHF through microwave frequencies or IF signal processing for this range. The winner of the design competition will receive a $1000 cash prize or a $2500 gift certificate for Mini-Circuits products. Second through sixth place winners will receive gift certificates worth $200. The competition is open to any SVHFS member (registration for the conference includes membership.)

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The SVHFS is helping to promote VHF activity through a new cumulative operating award called Worked All of 'EM. The award is for working all the grid squares EM00-EM99 on bands 50 MHz and up. The basic award is mixed band and honors QSL cards going back to the 1983 start of the grid-squares program. You may have already collected enough to qualify.

The SVHFS also sponsors the Fall VHF/UHF Sprints. The Sprints are held in the September–October timeframe each year and are broken up into separate events for each band 50 MHz through 432 MHz. The Microwaves (903 MHz and higher) are held together as a group.

The SVHFS has picked out dates for its future conferences and is looking for volunteers to help us host the conference in new locations. Cities with good facilities and easy access via interstate highways and airports are a plus. Anywhere east of the Mississippi River and south of the Mason-Dixon Line would be great. If you would like to have the SVHFS Conference come to your area, contact the SVHFS President, Bert Rollen, K4AR, at <k4ar@arrl.org>. Future conference dates are: April 29–30, 2005; April 28–29, 2006; and April 27–28, 2007.

For more information about the SVHFS and the activities it sponsors, visit <http://www.svhfs.org>.

Silent Keys

Bob Sutherland, W6PO, SK. The following is from Al Ward, W5LUA: "We are saddened by the passing of one of the great VHF/UHF pioneers, Bob Sutherland, W6PO. I have been in contact with Michael Bach, WB6FFC, who had the following to report: "I received the call from Bob's oldest daughter Sunday afternoon with the sad news about Bob's passing. Early Sunday morning Robert Sutherland, well-known moonbouncer, 48-year employee of Eimac as Director of Advanced Products lab, Editor of "The moon bounce notes," author of numerous Practical QRO VHF amplifier articles, member of the team that preformed the first amateur radio moon bounce, passed away some time between 8 and 9 AM on Sunday Jan 11.'"

Bruce Sternstein, K2RTH. On October 14, 2003 Bruce Sternstein, K2RTH, became a Silent Key, succumbing to the long-term effects of diabetes. Bruce was a well-known VHF operator, first in his native Long Island, New York QTH and later in the Miami, Florida area, where he practiced law after graduating from the University of Delaware Law School in 1978. Among those who remember Bruce well is Pete Heins, N6ZE, who wrote the following: "I knew Bruce from 1975 until 2003. Between 1975–1978 we worked over a 300-nm 2-meter path from Elizabeth City, North Carolina to Brooklyn, New York, approximately 300 nights/year. We also worked occasionally while he was a University of Delaware Law School student.

"We had our first eyeball QSO during 1979 when I moved to Homestead, Florida, and he and his wife Marian, KA4ULJ, moved to the Kendall section of Miami. We consistently worked on many of the VHF and above ham bands! Of note, he made his first 6-meter *F2* JA QSO with an old Swan 250 and a 1/4-wave whip poised on the balcony of his second floor condo during 1980 or so. Later when I moved to the Los Angeles area, we successfully worked on 2-meter EME, he with four Yagis and me with one Yagi and 300 watts. We also worked numerous times on 6 meter *F2* and sporadic-*E* at various power levels from micro-watts to 999 watts!

"In addition to our amateur radio friendship, Bruce was a true friend."

And Finally . . .

Over the past few issues of *CQ* you may have noticed expanded coverage in this column. While expanding the coverage of VHF and above activities in *CQ VHF* magazine, I am also trying to expand our coverage in this column. My purpose is to do a bit of cross-pollinating of the various uses of our favorite ham radio frequencies. In doing so, I hope to achieve an increased interest by readers in occupying our ham bands.

There is so many creative things to do on these bands, many of which cannot be done on the overcrowded HF bands. These activities also spawn creative modes of operation and creative uses of equipment, such as is documented in our opening piece on the first EBBE QSO.

What activities have you been involved in lately? Why not document it and send it to me. We may use it in this column, or we may develop it into an article for *CQ VHF* magazine. Either way, your creativity gets a boost and may inspire others to do the same or something similar.

Thank you again for supporting this, your VHF column. Until next month...

73 de Joe, N6CL

DX Happenings

BY CARL SMITH,* N4AA

Ah . . . March. Is that the hint of spring in the air? Writing so far ahead is difficult at times (I am writing this in mid-January). However, just the thought of warmer weather here in North Carolina makes it easier to bear the colder than normal weather we are experiencing.

Current DXpeditions and Contests

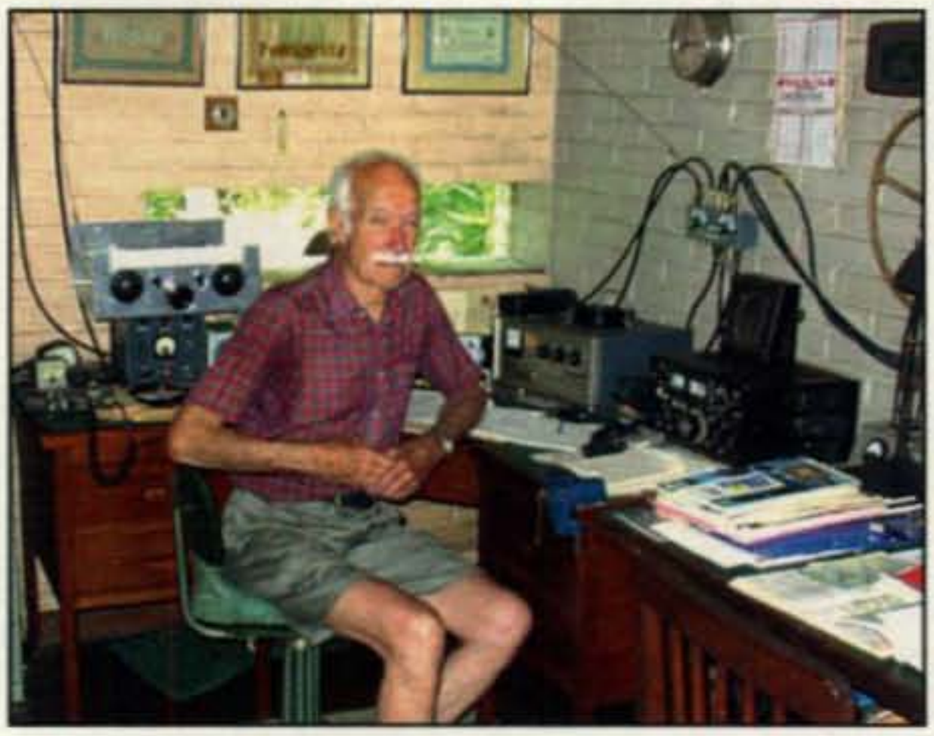
5V7C – Togo. A team of six French operators will be on the air from Togo for about a week from March 6–12. One of the ops is Dany, F5CW, who was part of the TO4E team at Europa.

FO/C – Clipperton. There is a very good chance that a group will be going to Clipperton sometime in March. John, N7CQQ, was putting together a team in early January.

T33C – Banaba. This one from the Pacific will generate a lot of activity, as Banaba is still ranked #27 worldwide on the current Most Wanted list. It is scheduled for the first two weeks of April.

We're still hoping to hear more about the announced DXpedition to Aves Island (YVØ) for January/February. If this operation does happen, it will generate a lot of activity for us between contest weekends.

Speaking of contests, as of this writing we still have the ARRL DX contest weekends to look forward to, February 21–22 for CW and March 6–7 for SSB. The way the solar cycle is running, it looks as if the low bands will make the difference this year. At least for the first few weeks of January, 10 meters was almost a "ghost town" most of the time, and 15 wasn't far behind. I've noted a dramatic increase in the activity on the low bands this winter season. Cluster spots for 160 and 80 meters far outnumber those on the upper bands, with even 20 meters not providing much activity. The WARC bands continue to show significant activity as many DXers try to add to their totals on those bands while waiting for the next "new one" to come along.



Horacio, CX3BH (ex-3A2CH), in his spacious ham shack. He is on the air daily around 21220 kHz at 2100Z with a group of his CX friends. That "big" cabinet on the left is his 75-meter AM kilowatt transmitter. (Photo courtesy of Rick, NE8Z)

Watch for the *major* DXpedition by the Five Star DX group as **3B9C, Rodrigues Island** March 20 to April 14. This is the same group that brought you 9MØC and D68C in years past. They have put together a "how to" guide for working DXpeditions. It designed mostly for the "Little Pistol," but many points apply to "Big Guns" as well. See the article "Yes, You *Can* Work a Big DXpedition," by G3NUG and G3XTT elsewhere in this issue of *CQ*. I urge all DXers to read it.

The above-mentioned article, along with the books *The Complete DX'er,* 3rd Edition, by Bob Locher, W9KNI, and *Up Two, the Adventures of a DXpeditioner,* by Roger Western, G3SXW, are all recommended reading for anyone who is gen-

*P.O. Box DX, Leicester, NC 28748-0249
e-mail: <n4aa@cq-amateur-radio.com>

Here we find a group from the Taipei Ham Club hosting a lunch for Charlie, N4CT. Left to right: Tony, BX2AE; Echo, BV2QB; Charlie, N4CT; Tim, BV2A; and Frank, BX2AG. Tim is now 88 years "young" and still sharp as a tack, according to Charlie. He was the only licensee in Taiwan for many years. Charlie comments, "These are all nice guys and they love CW." Tim attributes his good health to sending CW—hi. (Photo courtesy of Charlie, N4CT)

uinely interested in getting the job done in chasing DX and not alienating fellow DXers by using sloppy operating habits. Both books are available from CQ.

DX Pile-ups, Circa 1971

I have commented numerous times about sloppy operating habits, and a reader recently sent me a copy of a page from the October 1971 issue of *QST*. On page 61 of that issue, under the heading "Happenings of the Month," we find a letter from A. Prose Walker, at that time Chief, Amateur and Citizens Division of the FCC. I had to chuckle as I read the item, relating that 30+-year-old letter to current events. Here is what it says:

FCC Warning Re: DX Pileups

In July a DXpedition to Equitorial Guinea attracted quite a crowd of amateurs on the air. Some of them let impatience get the upper hand, creating unnecessary interference and displaying atrocious manners. In a recent letter to an amateur who had called the mess to the attention of the FCC, the Chief of the Amateur and Citizens Division replied:

"The matter referred to in your letter concerning the 3C1EG/3CØAN operation had already come to my attention. I also had observed it personally. Your observations and feelings express very well the reactions of all of us here, and I'm sure, the majority of radio amateurs throughout the United States.

"It is frustrating to observe such tactics and not be able to do more than place a call to one of our monitoring stations. *Indeed, should such obviously illegal and disgusting practices become prevalent, they could form the basis for measures to require automatic identification of amateur transmissions, over and above those now contained in the Rules.* Certainly I would not like to advocate such a step, for it would mean a significant departure from the traditional concept for a service which has regulated itself, by and large, up to the present.

"It is reassuring to receive your letter. I know you will do whatever is within your means to bring such operating tactics to a halt. I wish I could offer you some definite suggestions, but in matters like this an individual is somewhat limited. Thank you for writing and I hope to see you on the air some day.—A. Prose Walker, Chief, Amateur and Citizens Division"

Isn't it interesting that even after another 30+ years we still have this

The WAZ Program

15 Meter SSB

602 ..... JR3RGX

20 Meter CW

539 ..... HL3IB

160 Meters

191 ..... VE1ZZ (40 zones)
172 ..... K9JF (33 zones)

All Band WAZ
SSB

4892 ..... IK1SPR

Mixed

8268 ..... RAØJJ
8269 ..... UY5AA
8270 ..... G3OAG
8271 ..... JA7LMU
8272 ..... JH3LIB
8273 ..... SV1UG

All CW

395 ..... IK1SPR

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: **WAZ Award Manager, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577.** The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

5 Band WAZ

As of January 15, 2004, 640 stations have attained the 200 zone level and 1363 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:
PY3JZ

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
NN7X, 199 (34)
IK1AOD, 199 (1)
DF3CB, 199 (1)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W6SR, 199 (37)
W3NO, 199 (26)
K4UTE, 199 (18)
HB9DDZ, 199 (31)
RU3FM, 199 (1)
HB9BGV, 199 (31)
N3UN, 199 (18)
OH2VZ, 199 (31)
K5MC, 199 (22)
W1JZ, 199 (24)
K2UU, 199 (26)
W1WAI, 199 (24)
W1FZ, 199 (26)
SM7BIP, 199 (31)
PY5EG, 199 (23)
SP5DVP, 199 (31 on 40)
W8AEF, 199 (40)
K8RR, 199 (26)
UU5JR, 199 (4)
W8GF, 199 (22)
N4NX, 199 (26)
OE2BZL, 199 (1)
N4MM, 199 (26)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
K5PC, 198 (18, 23)
K4CN, 198 (23, 26)
KF2O, 198 (24, 26)
G3KMQ, 198 (1, 27)
N2QT, 198 (23, 24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18, 23)
US7MM,198 (2, 6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24, 26)
W4DC, 198 (24, 26)
N4XR, 198 (22, 27)
N4PQX, 198 (24, 26)
RU3DX, 198 (1, 6)
UT5JAJ, 198 (12, 30)
N6HR/7, 198 (34, 37)
OE2LCM, 198 (1, 31)
EA7GF, 198 (1, 27)
W7SX, 198 (18, 23)
UT3UA, 198 (1, 6)

The following have qualified for the basic 5 Band WAZ Award:

F3SG (173 zones)
N8MR (152 zones)
RAØJJ (174 zones)
F9XL (177 zones)
IZ1ANU (184 zones)
UY5AA (190 zones)

Endorsements:

N4MML (199 zones)
RU9TO (197 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $80 ($100 if airmail shipping is requested).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: **WAZ Award Manager, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577.** The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

The WPX Program

CW

3129 ..... RW3SU

SSB

2886 ..... IZ1AOD
2887 ..... K3MI
2888 ..... KC2HZW

Mixed

1930 ..... W3UTD
1931 ..... G4XBL

CW: 600 W2OO. 650 N7WO. 900 VE6ZT. 1000 T94GB, SP3JUN. 1200 K6UXO. 1450 AA1KS. 2250 S51NR. 2300 KF2O. 2450 I7PXV. 4900 WA2HZR.
SSB: 400 IZ1AOD, N2CJN. 650 K3MI. 700 IZØBNR. 800 OM7CA. 850 VE6ZT. 1000 UA1ZKF. 4150 I2PJA.
MIXED: 1250 K6UXO, W2FKF. 1350 VE6ZT. 4200 I2PJA..
10 Meters: VE6ZT, KC2HZW
15 Meters: UA1ZKF
20 Meters: SP3JUN
40 Meters: SP3JUN
80 Meters: SP3JUN
Asia: SP3JUN
No. America: OM7CA, UA1ZKF
Africa: T94GB, W2OO
So. America: VE6ZT, T94GB
Europe: N2CJN
Oceania: T94GB, SP3JUN

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, W4BP, K4LQ, KØKG, DL6ATM, VE9FX, DL2CHN, W2OO, AI6Z, RU3DX.
160 Meter Endorsement: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SM0DJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DZZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, W4GP, DL6ATM, W2OO, RU3DX.
Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA. *Note: WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.*
Please Note: As of February 2004, the price of the 160 meter bar for the Award of Excellence is now $6.50.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 335 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement stickers is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

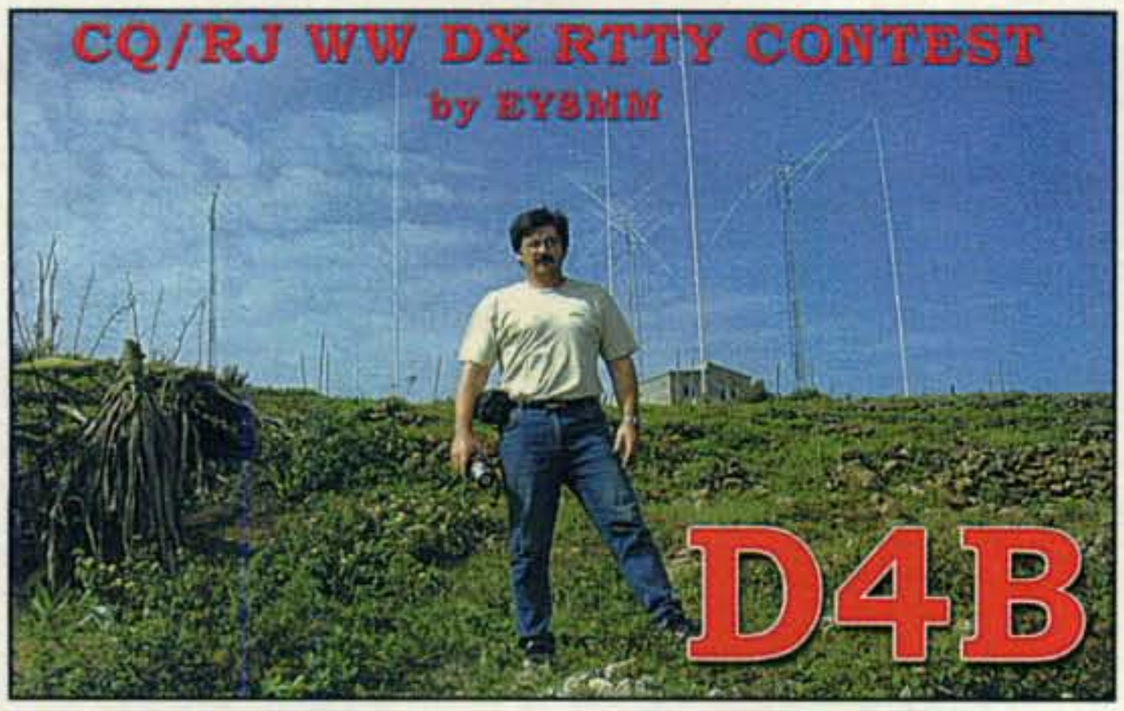
K2TQC 334	K4MQG 334	N5FG 333	VE3XN 331	G3KMQ 329	W6OUL 327	9A2AJ 323	F5OIU 317	VE7KDU 300
K2FL 334	EA2IA 334	N7RO 333	W1WAI 331	KZ4V 329	IT9TQH 326	W6SR 323	YT1AT 317	W9IL 300
K9BWQ 334	PA5PQ 334	K4CN 333	K2JF 331	N5HB 329	I2EOW 326	KUØS 322	K8JJC 315	KØHQW 299
K9MM 334	K3UA 334	W4MPY 333	K3JGJ 331	W4UW 329	NC9T 326	KE5PO 322	CT1YH 313	WG7A 295
W7OM 334	DL3DXX 334	PY2YP 333	PT2TF 331	K1HDO 328	W7IIT 326	K6CU 321	PY4WS 313	KE3A 295
K2JLA 334	K2ENT 334	W8XD 333	W2VJN 331	K7JS 328	W4LI 325	HA5DA 321	N1HN 313	K4IE 291
N7FU 334	OK1MP 334	KA7T 332	N4CH 331	K9OW 328	I5XIM 325	IKØTUG 321	K9DDO 312	KD8IW 288
K2OWE 334	NC9T 334	WØJLC 332	W2UE 330	WA8DXA 328	K5UO 325	VE7DX 320	W3II 312	EA3BHK 282
N4MM 334	WB5MTV 333	K8LJG 332	I4LCK 330	K8PV 327	IK2ILH 325	IKØADY 320	W6YQ 312	YC2OK 282
F3TH 334	W7CNL 333	YU1AB 332	VE7CNE 330	W4QB 327	N5FW 325	WG5G/QRPp 320	UA9SG 309	DJ1YH 281
F3AT 334	YU1HA 333	K5RT 332	4N7ZZ 330	I1JQJ 327	9A2AA 325	N7WO 320	KF8UN 308	XE1MD 278
DJ2PJ 334	IT9QDS 333	YU1AB 332	W6DN 330	I4EAT 327	N4OT 325	HA5NK 319	YU7FW 306	EA2CIN 278
WA4IUM 334	G4BWP 333	NØFW 332	K7LAY 330	DL8CM 327	LA7JO 324	F6HMJ 319	LU3DSI 302	I3ZSX 276
W4OEL 334	K4CEB 333	N4AH 332	WB4UBD 330	SM6CST 327	SM5HV/HK7 324	OZ5UR 319	N1KC 302	G3DPX 275
W2FXA 334	K4IQJ 333	HB9DDZ 332	YU1TR 330	N4KG 327	K1FK 324	G3KMQ 317	KH6CF 301	WA4DOU 275
N4JF 334	WØHZ 333	K6LEB 331	K9IW 330	K4JLD 327				

SSB

K6YRA 335	4Z4DX 335	N4CH 334	VE4ROY 332	W9OKL 329	IØSGF 327	EA3CYM 323	WZ3E 314	K6GFJ 299
K2TQC 335	N7RO 335	K3UA 334	W7FP 332	DU1KT 329	IT9TQH 327	F6BFI 322	IZ6CST 314	VE7SMP 297
W6EUF 335	IØZV 335	K4JLD 334	K9HQM 332	I2EOW 329	IT9TGO 327	K6CF 322	K9YY 313	AC6WO 297
K2JLA 335	EA2IA 335	N5ZM 334	CT1EEB 332	VE7DX 329	DK5WQ 327	LU7HJM 322	NØMI 313	WA1ECF 295
K4MQG 335	IN3DEI 335	PY2YP 334	W2FKF 332	W2FGY 329	UY5XE 327	K5NP 322	W7GAX 312	KW1DX 295
IK1GPG 335	EA4DO 335	AA4S 334	DL9OH 331	CT1EEN 329	KW7J 327	WA4ZZ 322	VE3CKP 311	N5WYR 293
K5OVC 335	PA5PQ 335	K1UO 334	N2VW 331	CT1CFH 329	KE5K 327	WN9NBT 322	CT1YH 311	K7ZM 292
NØFW 335	K9OW 335	CT3DL 334	YZ7AA 331	EA1JG 329	I1JQJ 327	LU5DV 322	YV5NWG 311	OA4EI 292
K9MM 335	W6DPD 335	NC9T 334	YV1JV 331	KE4VU 328	CP2DL 327	WW1N 322	LU3HBO 310	KØOZ 291
W6BCQ 335	XE1VIC 335	W9SS 334	WA4WTG 331	K1HDO 328	NI5D 327	W6OUL 322	HA6NF 310	W9ACE 291
XE1AE 335	K2ENT 335	VE7WJ 334	W8KS 331	K5UO 328	W6SR 326	N3RX 321	WA5MLT 310	W4PGC 290
W7OM 335	OK1MP 335	VE2PJ 334	YV5IVB 331	KF8UN 328	N4KG 326	XE1CI 321	XE2LV 310	I3ZSX 290
KZ2P 335	IZ6GPZ 335	4N7ZZ 333	KX5V 331	EA3EQT 328	K7TCL 326	CT1ESO 321	EA3BHK 307	WØROB 287
IK8CNT 335	WDØBNC 334	KE5PO 333	I8LEL 331	WØULU 328	W9HRQ 326	EA8TE 321	RW9SG 307	KKØDX 285
VK4LC 335	DU9RG 334	VE1YX 333	K3JGJ 331	K1EY 328	W4QB 326	W6MFC 321	XE1MDX 305	VE7HAM 285
OE7SEL 335	K2FL 334	I4LCK 333	N5ORT 331	KZ4V 328	K8PV 326	N4CSF 320	EA5OL 305	F5RRS 284
VE3MR 335	WØYDB 334	W2JZK 333	PT2TF 331	XE1D 328	DL6KG 326	N4HK 320	WB2AQC 305	N8LIQ 284
VE3MRS 335	W4UW 334	K8LJG 333	CT1AHU 331	KD8IW 328	W4LI 326	KØFP 320	KC4FW 304	WØIKD 283
K4MZU 335	K9BWQ 334	VE4ACY 333	EA3JL 331	KE3A 328	WR5Y 326	EA7TV 320	K3BYV 303	KBØRNC 282
OZ5EV 335	W4NKI 334	KØKG 333	W6DN 330	W9IL 328	W5LLU 326	SV1RK 320	YC2OK 303	WN6J 281
N7BK 335	WB4UBD 334	W4WX 333	K8CSG 330	K3LC 328	N1ALR 326	N1KC 320	WB2NQT 303	IK8TMI 281
K7LAY 335	W4UNP 334	VE2WY 333	YV1CLM 330	K8DXA 328	HB9DDZ 326	W5GZI 320	VK3IR 303	F5JSK 281
ZL3NS 335	W8AXI 334	WB3DNA 333	LA7JO 330	I1EEW 327	WA4JTI 325	SV3AQR 320	VE7KDU 302	KA5OER 280
N4MM 335	VE2GHZ 334	K9PP 333	AB4IQ 330	SV1ADG 327	KC4MJ 325	WA4DAN 319	W2GZI 302	KK5UY 280
OZ3SK 335	OE2EGL 334	W2CC 333	AE5DX 330	DL8CM 327	PY2DBU 325	CE1YI 318	N5QDE 302	F5INJ 279
K7JS 335	WA4IUM 334	W3AZD 333	KB2MY 330	F9RM 327	IKØIOL 325	W5OXA 317	KD4YT 302	EA3CWT 278
XE1L 335	K5RT 334	DL3DXX 333	K3PT 330	XE1MD 327	YT1AT 325	YV4VN 317	KK4TR 301	VE2DRN 277
YU1AB 335	W2FXA 334	EA3BMT 333	ZL1BOQ 330	I4EAT 327	K7HG 324	EA5GMB 317	VE7SMP 301	9A9R 277
OE3WWB 335	N4JF 334	YV1KZ 332	K9IW 330	W3GG 327	AC7DX 324	KD5ZD 317	SV2CWY 300	W6UPI 276
K5TVC 335	W6SHY 334	YV1AJ 332	WS9V 329	AA6BB 327	KØHQW 324	KE4SCY 317	4X6DK 300	Z31JA 275
N5FG 335	W5RUK 334	KSØZ 332	K2JF 329	SM6CST 327	EA3BKI 323	K6RO 316	YT7TY 300	G4URW 275
DJ9ZB 335	K4CN 334	I8KCI 332	ZL1AGO 329	WD8MGQ 327	K4JDJ 323	N5HSF 316	XE2NLD 300	VE2AJT 275
PY4OY 335	EA3KB 334	LU4DXU 332	N5FG 329	CX4HS 327	W6WI 323	N8SHZ 316	K4IE 300	4Z5FL/M 275
VE3XN 335								

RTTY

K2ENT	333	K3UA	327	EA5FKI	320	G4BWP	312	PA5PQ	311	W4EEU	299	I2EOW	291	W4QB	280	YC2OK	280
WB4UBD	330	NI4H	325	W2JGR	316	OK1MP	312	N5FG	305	KE5PO	297	I1JQJ	289				



Nodir, D4B/EY8MM, is shown here at the D4B location on Cape Verde Island. This is his QSL for the CQ WW DX RTTY Contest in Sept. 2003. His single op, all band, high power score was 7,896,564 points (3677 QSOs). (QSL via John, KDØJL)

problem? One would think that in that length of time we would have evolved to a higher level. Apparently not everyone has "seen the light" yet. What to we do? I note that in Mr. Walker's response he says, "… I know you will do whatever is within your means to bring such operating tactics to a halt. . . ." I hope you all realize that this has been my intent by continuing to refer to these problems in this column. I hope that most of you take my comments seriously enough to "think before *you* yell" the next time the frequency police start yelling "UP UP UP" or "SPLIT SPLIT."

The books and articles I mentioned earlier address such things too. I can't emphasize enough that you really should get these books and read them. Take them to heart and follow the suggestions given. It will make things better for all of us.

Charlotte Hamfest

The Charlotte, North Carolina Hamfest will be held March 13–14. This is always a very large event and this year will be

Here's a "Double Scotch" for 2004. On the left is Sandy, GM#BCL, and on the right is John, GM4NHI. John's wife is in the middle. We all wonder, "What do they wear under those things?" (Photo courtesy of Sandy, GM3BCL)

QSL Information

5H3RK via W3/VK4VB
8P9CR via LA4LN
8P9CS via LA4LN
9Y4/LA4LN via LA4LN
DL/LA4LN via LA4LN
EI4VBH via LA4LN
GØ/LA4LN via LA4LN
G5BLT via LA4LN
G5BPQ via LA4LN
GMØ/LA4LN via LA4LN
GM5BLT via LA4LN
HBØ/LA4LN via LA4LN
HB9/LA4LN via LA4LN
I0/N4ZC via N4ZC
I2/N4ZC via N4ZC
I4/N4ZC via N4ZC
IN3/N4ZC via N4ZC
J37ZF via LA4LN
J37ZG via LA4LN
J6/LA4LN via LA4LN
J64AS via N9AG
J68AS via N9AG
J6A via N9AG
J6DX via N9AG
J6LSC via N9AG
J73ALN via LA4LN
J8/LA4LN via LA4LN
JE7RJZ via JE7RJZ
JE7RJZ/JT via JE7RJZ
JT1/JE7RJZ via JE7RJZ
JW4LN via LA4LN
KH6/LA4LN via LA4LN
KH8/LA4LN via LA4LN
LA1V via LA4LN
LA2SR via LA4LN
LA4JAM via LA4LN
LA4LN/SM via LA4LN
LA4LN/TF via LA4LN
LA4LN/VE via LA4LN
LA4LN/W via LA4LN
LA4SS via LA4LN
LC1J via LA4LN
LC1J via LA4LN
LN1V via LA4LN
LN1V via LA4LN
OE/LA4LN via LA4LN
OH/LA4LN via LA4LN
OHØ/LA4LN via LA4LN
ON/N4ZC via N4ZC
ON8XJ via LA4LN
OY/LA4LN via LA4LN
OZ/LA4LN via LA4LN
PA/LA4LN via LA4LN
PA/N4ZC via N4ZC
PJ2/WØCG via N9AG
PJ2/W8TK via N9AG
PJ2C via N9AG
PJ2DX via N9AG
PJ2H via N9AG
PJ2HQ via N9AG
PJ2M via N9AG
PJ2T via N9AG
PJ2Z via N9AG
PJ7/N4ZC via N4ZC
PJ8/N4ZC via N4ZC
T32T via LA4LN
T88JZ via T88JZ
XE1ISC via LA4LN
XU7AAY via N4ZC
XU7AAZ via N4ZC
Z2/VK4VB via W3/VK4VB

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," 106 Dogwood Dr., Paris, TN 38242; phone 731-641-4354; e-mail: <golist@golist.net>.)

no exception. I'll be conducting a DX Forum on Saturday, the time to be announced later. I expect to present a good program, with DXers and DXpeditioners speaking and answering questions from the audience. We'll have some really nice door prizes also. If you are within commuting distance, I hope you'll come to Charlotte and join us for the forum and also for the annual DXers' dinner Saturday evening.

I'll also be spending some time at the CQ booth, as well as with my own group, the Southern Appalachian Radio Museum of Asheville, North Carolina. The museum tables will have some display pieces as well as a number of items for sale. I'll be happy to "meet and greet" any of you at one of these places that weekend in Charlotte.

CQ DX Awards Program

SSB

2421 .....W7PVE
2422 .....F5SJF
2423 .....W1NXB

SSB Endorsements

320.....VE7PJ/334
320 .....W9SS/334
320 .....NC9T/334
320 .....EA3BMT/333
320 .....EA1JG/329

CW Endorsements

320 .....NC9T/334
320 .....W8XD/333
200 .....NØTNJ/212
3.5/7 MHz N7WO
28 MHz N7WO

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 335 active countries. Please make all checks payable to the award manager.

Z31PK, Silent Key

One last-minute sad item. I received an e-mail from DJØLZ telling of the passing of Pepi, Z31PK, on January 14th. DJØLZ was the QSL Manager for Pepi and asked that I mention his passing in *CQ*. He said, "Pepi was one of the best teachers for all of us in Macedonia." Our condolences to Pepi's family and friends. May he rest in peace.

Until next time, enjoy the chase and have fun . . . 73, Carl, N4AA

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awards

BY TED MELINOSKY,* K1BV

Council of Europe Awards and more

This month we begin with the story of Tom Conway, K7REL, who earned USA-CA #1076, September 27, 2003.

When Ted, K1BV, asked me to write a short biographical sketch as part of my USA-CA application, I wasn't sure where to begin. I imagine, though, the most logical place to begin is at the beginning.

I never really thought of it before, but I guess I probably owe my interest in amateur radio to the fact that I began reading and writing at an early age. My father was a college teacher, and there were always books lying around the house. When I was about nine or ten years old, I began reading ancient Greek mythology and studying Roman history. By the fifth grade I was reading Hitler's *Mein Kampf* and studying the writings on Communism of Marx, Engels, and Lenin, not a very popular thing to do in a parochial school at that time. But I always figured the best way to know your "enemy" is to study him, not fear him.

Then along came school desegregation and the Civil Rights movement, so I studied Gandhi and Martin Luther King, the Civil War, and the American Revolution. At about the same time, I began collecting stamps, looking at the maps, the faces, and landscapes from all over the world. I bought a world atlas so I could find where all these countries were located. I became interested in shortwave radio as a way to find out more about these people living in those far-off countries, to listen to them in their own words and in their own languages. Thus, I have studied French, German, Spanish, and Russian, some Italian and a little bit of Japanese and Chinese as well.

Eventually I managed to save enough from my newspaper route earnings to buy a brand-new RCA Stratocruiser for about $300, a lot of money for a 13-year-old kid back in 1960. The Zenith Transoceanic was just too expensive for me ($400).

One day while tuning across the shortwave bands, I heard these strange people talking about vacuum tubes and amplifiers, and calling something like "CQ." Just the idea of talking into a microphone or pounding on a Morse code key and being able to communicate with people all over the world was fascinating to me! As a result, I began studying for my amateur radio license. My father, who had served in World War II as a radio operator aboard B-17s and B-24s in Europe, knew Morse code and bought me a code oscillator attached to a base which had all the Morse characters right there on top. At night my friend and I used flashlights to send Morse messages across the street to one another. Whenever we took a trip in the car, that code oscillator went with me, tapping out the Morse characters of road signs I saw as we drove along the streets.

I got my Novice license in November 1961, when I was 14 years old, and my General class license about six or seven months later, back when you still had to pass the written exam and be able to both send and receive CW to the satisfaction of an FCC examiner. You would be surprised how many people passed the written exam and code receiving exam, only to fail to get their license because they didn't have a good enough "fist" to suit the examiner!

Over the years I haven't always been as active on the air as I would have liked to be, what with four years overseas in the military, then going to college, getting married, and raising a family, but my love for amateur radio has never waned. I have always remained fascinated by the communications aspects of amateur radio and the many good services for which it can be used.

I had been interested in working counties ever since I was a kid, but thought it too difficult, since we didn't have the computers and software we now have to track things. I had to look up every QSL card in my atlas to find out in what counties the towns were located. Then in June of 2001, I came across an internet link about county hunting; it listed the various net frequencies, so I tuned into the County Hunters Net on 14.336 MHz one day. It sounded like complete chaos! I thought they were cheating, using "relays" and "double relays." I turned off the radio, disgusted with the whole thing. The next day I listened some more, and found that the net was, in fact, very strictly regulated. The relays were only used to give the weaker stations a chance to work the mobiles running counties. The net control station(s) made sure that the signal reports were correctly sent and received, and still you had to get written confirmation for the contacts in order to qualify for the USA-CA Award.

I finally got up the nerve to put out a call, thinking I had already listened long enough to have mastered the net protocol, but was immediately chastised for giving my callsign phonetically. Boy, was I upset; no phonetics! For me phonetics were to ham radio what apple pie and hamburgers are to most Americans. After e-mailing the NCS and several other county hunters, they explained that phonetics are frowned upon because it takes up too much time and covers up the mobiles and other stations calling. They were absolutely right, I learned later. The next day I did better, and have become so addicted to county hunting now that I have have a little Yaesu FT-100D installed in the car so I can put out some counties myself.

It took me two years, three months to get that elusive "last" county and qualify for USA-CA All Counties. I started working about 150 to 200 counties a month, mostly on weekends and early mornings before going to work.

*12 Wells Woods Rd., Columbia, CT 06237
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

Carol J. Bolling, KA4TYG
USA-CA All Counties #1085
December 11, 2003

USA-CA Honor Roll

500

JN3SAC	3281
KA4TYG	3282
W5IIO	3283

1000

KA4TYG	1648
W5IOO	1649

1500

W3SB	1376
KA4TYG	1377
W5IIO	1378

2000

W3SB	1273
KA4TYG	1274
W5IIO	1275

2500

W3SB	1193
KA4TYG	1194
W5IIO	1195

3000

KA4TYG	1105
W5IIO	1106

The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.

After about a year, my count dropped off to about 100 counties per month. Then two years later, when I reached the 3000 level, things really started to slow down. Thinking I might never make it to number 3077, I began e-mailing fixed stations in the counties I still needed, asking to set up schedules with them. The response was unbelievable! So many stations responded that I actually had trouble managing my e-mail. Ham operators fighting cancer, recovering from open-heart surgery, others running outside to hook up their antennas, getting their rigs back up and running after years of not being on the air. Many of them e-mailed back, telling me just how *honored* they felt just to be able to help out. I even had the privilege of working Harold, WA4DZE, the only fixed station licensed in Wheeler, Georgia. Then KØEVE, driving from Idaho to his summer cabin in Minnesota, gave me my second to the last county—Pierce, North Dakota. Then it was Vernon, NZ8K, driving several hours down through the mountains of West Virginia and southeastern Kentucky to give me my last for the "whole ball of wax"—Letcher County, Kentucky. What a really great bunch of people!

Again, I want to thank the two mainstays of the County Hunters Net, Jim, K2JG, and Alan, VK4AAR, in far-off Australia, for donating all their time, as well as all the other net control stations and the literally hundreds of mobiles and fixed stations for all their help. I couldn't have made it to USA-CA All Counties without you! *—73, Tom, K7REL*

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This fifteen month calendar (January 2004 through March 2005) includes dates of important Ham Radio events such as major contests and other operating events, meteor showers, phases of the moon, and other astronomical information, plus important and popular holidays. This calendar is not only great to look at, it's truly useful too!

Please note: We will not be offering a Classic Radio Calendar for 2004

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The Order of Boiled Owls of NY 50th Anniversary Award

At times, just the name of an award is so intriguing that it deserves to be publicized. This is the case with an award from an old-time New York contesting club, The Order of Boiled Owls. It may be descriptive of how a dedicated contester feels after enduring a 48-hour marathon with headphones invented by Satan himself, subsisting on a not very healthy diet of chips, pop, and coffee, and surviving a thousand little dogfights over a rare section or multiplier. Yes, the "boiled owl" description makes sense under these conditions.

The Order of Boiled Owls of New York, established in 1954 and dedicated to amateur radio HF contesting and DXing, invites radio amateurs worldwide to join the celebration of their golden anniversary in 2004 by "working the Owls" to obtain a handsome certificate for the OBO 50 Award. It is available to all licensed amateurs worldwide. All frequencies under 54 MHz may be used. All modes, no band or mode endorsements. Earn 5 points by working members or their club stations during calendar year 2004.

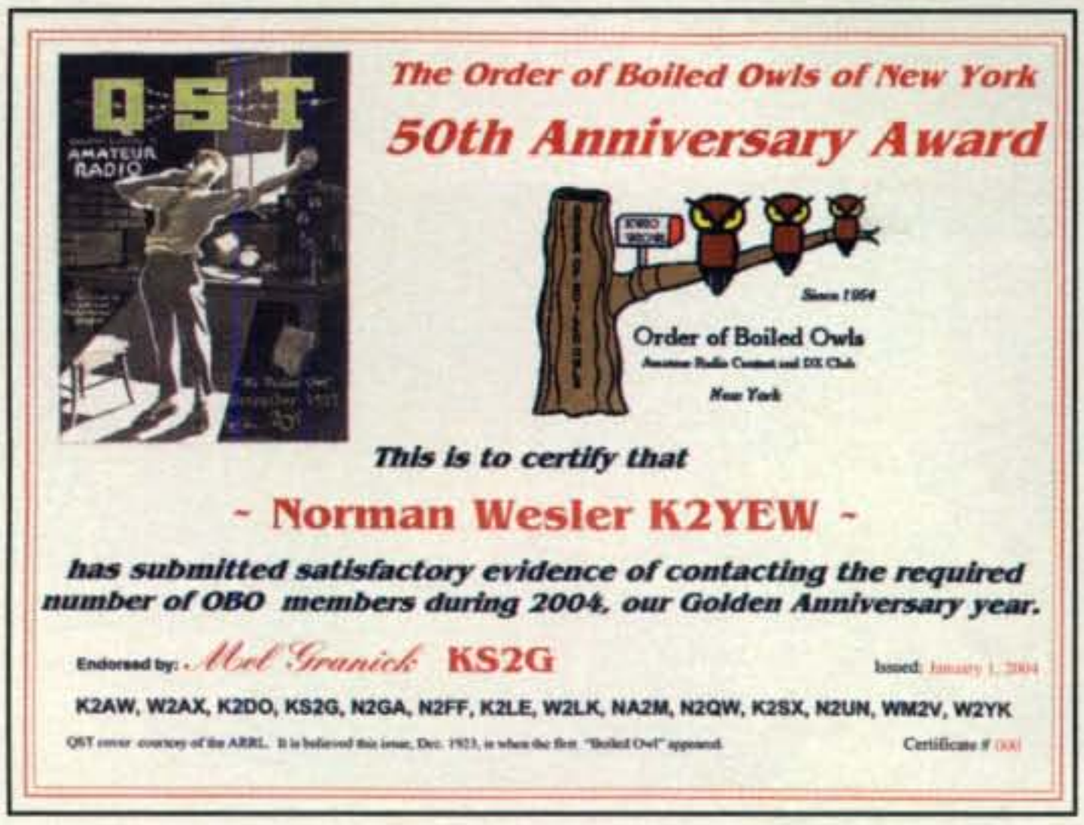
Club stations KW2O and W2OWL = 2 points.

Members: N2GA, K2AW, W2AX, N2FF, K2DO, W2YK, N2UN, K2SX, WM2V, NA2M, and KS2G = 1 point each.

Each callsign may be worked only once. DX portable operations by these stations count as separate callsigns. An endorsement is offered for accumulating ten "contact credits." To receive an award certificate, mail contact logs (no QSLs required) to Dennis McAlpine, K2SX, Secretary, Order of Boiled Owls of New York, 12 Ridgecrest East, Scarsdale, NY 10583. Enclose $3.00 (U.S.) or 4 IRCs to cover certificate and mailing costs.Award applications must be received by March 31, 2005. Website: <http://www.obony.org>; questions, e-mail: <K2SX@arrl.net>.

Council of Europe Award Series

The Council of Europe is the continent's oldest political organization, founded in 1949. It consists of 45 countries, including 21 countries from central and eastern Europe and is distinct from the 15-nation European Union. Its headquarters is in Strasbourg, in northeastern France. Since 1989, its main job has been acting as a political anchor and human-rights watchdog for Europe's



The Order of Boiled Owls of New York, which is dedicated to HF contesting and DXing, celebrates its golden anniversary in 2004 by offering a certificate for working its members.

post-communist democracies, assisting the countries of central and eastern Europe in carrying out and consolidating political, legal, and constitutional reform in parallel with economic reform, and providing know-how in areas such as human rights, local democracy, education, culture, and the environment. It has developed 193 legally-binding European treaties or conventions, many of which are open to non-member states, on topics ranging from human rights to the fight against organized crime and the prevention of torture, to data protection or cultural co-operation.

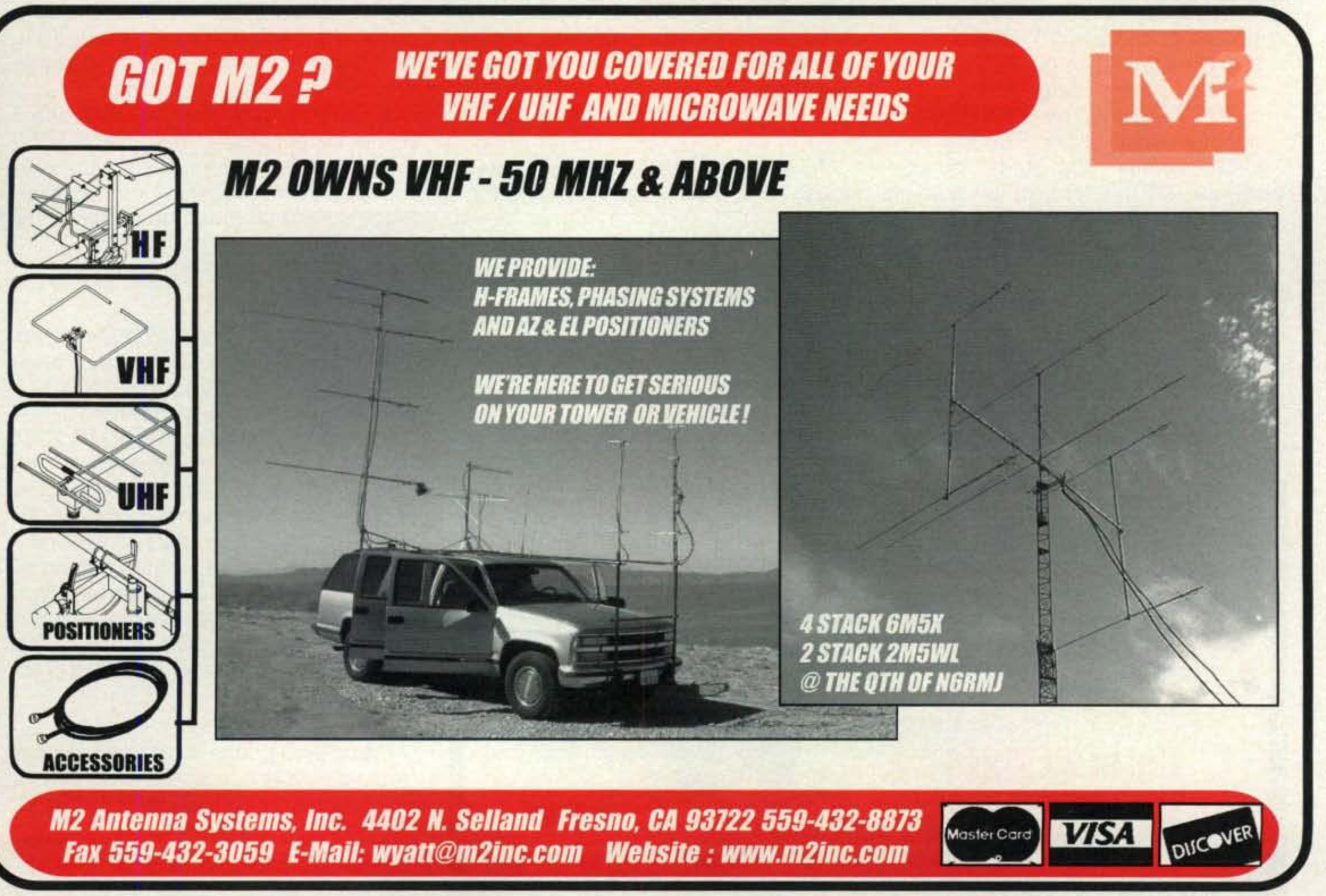
The Council of Europe Radio Club operates TP2CE (and other prefixes) from their Strasbourg headquarters location. The club sponsors several well-designed, colorful certificates, featured this month.

General Requirements: Send GCR list and fee of $US10, 9 Euros, or 14 IRCs. Fee for Top List EWWA is $US22, 20 Euros, or 30 IRCs. Apply to Kremer Francis, F6FQK, 31 rue Louis Pasteur, F-67490 Dettwiller, France; or Conseil de L'Europe, Regie des Moyens Audiovisuels, CERAC, Mr. Kremer Francis, F-67075 Strasbourg, Cedex, France. Internet: <http://ewwa.free.fr>; e-mail: <f6fqk@free.fr>.

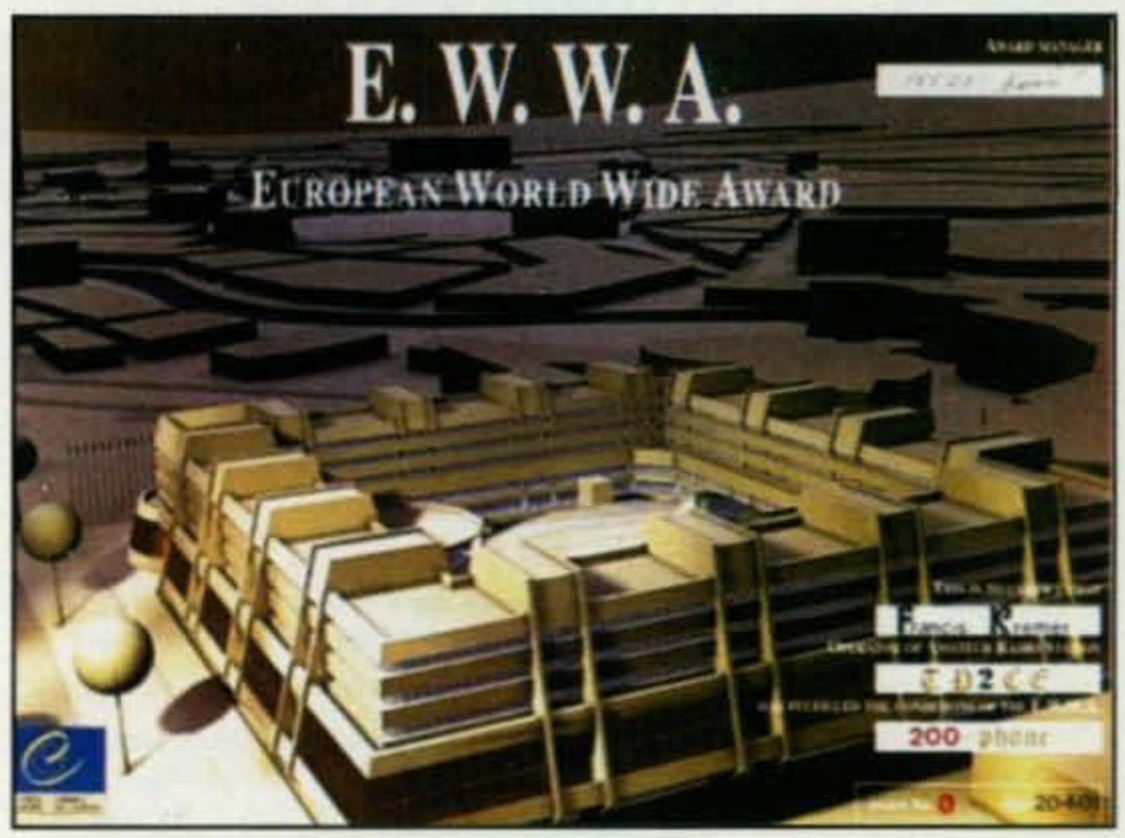
Council of Europe Award. Make one contact with each of the 45 member states of the Council of Europe plus Radio Club TP2CE (or any other TP special call). The award is available with endorsements for Mixed mode, CW, Phone, RTTY, Monoband, 5-Band, 9-Band, YL operator, 2/50 MHz, and Satellite. Contacts on or after 1 June 1980 count for the award.

Members of the Council of Europe are Albania, Andorra, Armenia, Austria, Azerbaijan, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Macedonia, Moldova, The Netherlands, Norway, Poland, Portugal, Romania, Russia, San Marino, Serbia-Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, and United Kingdom.

European World Wide Award. This award was created by the Radio Club of the Council of Europe. The EWWA country list is basically the DXCC country list but excludes unclaimed territories or those lacking permanent sovereignity, demilitarized zones or neutral zones, military bases abroad of the parent country, and other political "fictions" such



To earn the Council of Europe Award, make one contact with each of the 45 member states of the Council of Europe plus Radio Club TP2CE (or any other TP special call).



The European World Wide Award was created by the Radio Club of the Council of Europe and is available for working countries on the EWWA country list.

as embassies, monuments, religious entities, or agencies of international organizations. A complete list is found at: <http://ewwa.free.fr>. If you do not have access to the internet, send an SASE to K1BV for a copy.

The award is available to all licensed amateurs and SWLs who fulfill the following requirements:

1. HF

a. Mixed (CW/Phone/RTTY)—200 confirmed contacts with 200 different countries on the EWWA list.

b. CW—same, using CW.

c. SSB—same, using SSB.

d. RTTY—same, using RTTY.

e. PSK—same, using PSK31.

f. Monoband—200 confirmed contacts with 200 different countries on the following bands: 20, 17, 15, 12, or 10 meters. Or 100 confirmed contacts with 100 different countries on the following bands: 160, 80, 40, 30 meters (Mixed, SSB, CW, or RTTY).

g. 5-Band—100 contacts on each band 80, 40, 20, 15, 10 meters, made in Mixed mode, SSB, CW, or RTTY.

h. 9-Band EWWA—as above for the 5 bands, but on the following: 160, 80, 40, 20, 17, 15, 12, and 10 meters.

i. EWWA YL—50 contacts with 50 YLs from 50 different countries of the EWWA list.

j. Top List HF EWWA—make a total of 300 confirmed countries in mixed modes (CW, SSB, RTTY). Special plaque available.

2. VHF

a. 144 MHz—30 confirmed countries using FM, SSB, CW, or Mixed.

b. 50 MHz—50 confirmed countries using SSB, CW, RTTY, or Mixed.

3. Satellite

a. 100 confirmed countries.

A GCR list will be accepted. Contacts must have been made on or after 1 January 1980. All contacts must be with land stations. Contacts with portable stations are okay, but portable stations may not earn the award. Software for managing contacts towards the award is available on the <http://ewwa.free.fr> website.

Council of Europe Radio Club Challenge. On the occasion of the 18th anniversary of its establishment on 26 June 1986, the Council of Europe Radio Club (TP2CE) is sponsoring a competition open to all radio amateur operators. QSOs with all the different prefixes ever used by the club since its creation are valid. Cards are not needed. A summary of the contacts made on any HF bands listing the prefix, band, mode, date, and time should be sent to the sponsor listed above. The first three highest scoring stations will receive a cup and a special Council of Europe gift. The fourth and fifth highest scoring stations will receive a special gift.

Scoring: 1 point for each QSO, and 2 points for each QSO made with TP50 (50th anniversary of the Council of Europe). All submissions for this challenge should be made on or before 30 June 2004.

URL of the Month

IOTA (Islands On The Air) celebrates its 40th anniversary in 2004. They have prepared a special edition of the IOTA program of awards to promote IOTA activity and to have fun. The IOTA 2004 Programme is administered by the Chiltern DX Club (CDXC) and the UK DX Foundation on behalf of the RSGB IOTA Committee. Full details of the program are at: <http://www.cdxc.org.uk/iota2004_f.htm>. This is an excellent way to contact additional islands to add to your totals and participate in the anniversary celebration of this extremely popular award.

Clubs and groups: I still need to hear from you. *CQ* magazine is an excellent way to publicize your award to the world.

73, Ted, K1BV

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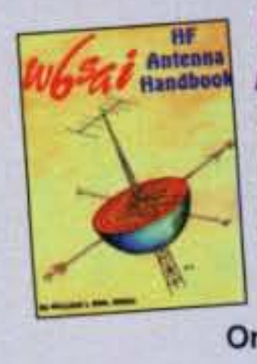

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by Dave Mangels, AC6WO

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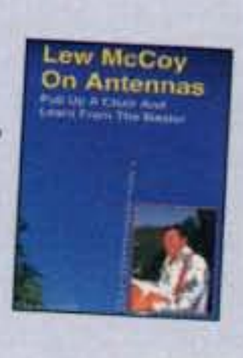

Unlike many technical publications, Lew presents his invaluable antenna information in a casual, non-intimidating way for anyone!

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by Chuck Penson, WA7ZZE

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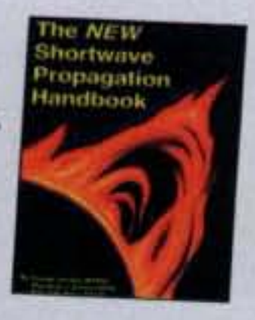

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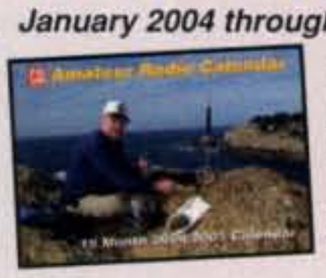

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contesting

BY JOHN DORR,* K1AR

Are We Having Fun Yet?

March's Contest Tip

Have you ever checked out the network of ham radio beacons that exists around the globe? There are an amazing number of them that are active 24 hours a day, albeit mostly on 10 meters and above. Check out <http://www.angelfire.com/sc/scannerpost/beacon.html> as well as a number of other internet sites for more information. These resources, combined with commercial broadcasters, time sources, and other "non-amateur" transmissions, can be an important tool to help you understand the state of propagation on what otherwise might be viewed as a dead band. For example, a quick check of the broadcasters above the high end of 15 meters can give you a clue about what time the band will be opening to Europe. Give that VFO a workout and you'll know more about the bands than the next guy for sure!

Calendar of Events

Feb. 21–22	ARRL CW DX Contest
Feb. 28–29	**CQ WW 160M SSB Contest**
Feb. 28–29	REF SSB Contest
Feb. 28–29	UBA CW DX Contest
Feb. 28–29	Mississippi QSO Party
Feb. 29–Mar. 1	North Carolina QSO Party
Mar. 6–7	ARRL SSB DX Contest
Mar. 13–14	YL ISSB QSO Party
Mar. 13–14	RSGB Commonwealth Contest
Mar. 14	North American RTTY Sprint
Mar. 14	UBA Spring Contest
Mar. 14–15	Wisconsin QSO Party
Mar. 20–21	Russian DX Contest
Mar. 20–22	BARTG HF RTTY Contest
Mar. 20–22	Virginia QSO Party
Mar. 27–28	**CQ WW SSB WPX Contest**
Mar. 27–28	Oklahoma QSO Party
Apr. 3–4	SP DX Contest
Apr. 3–4	EA RTTY Contest
Apr. 3–4	Missouri QSO Party
May 29–30	**CQ WW CW WPX Contest**

Let me begin this month by asking you a question. Do you have fun operating contests? That may seem like a strange question, but it does have some merit. Naturally, your initial reaction is likely to be, "Of course I do." However, let's drill into the topic a bit more and see what happens.

I've been active in contest operating for nearly 35 years. It was actually the first activity I ever experienced in ham radio. In fact, I was operating a contest (albeit the U.S. Field Day) even before I got my ham license. For me, being naturally competitive, it was a natural extension of things I like to do. The fact that through contesting over the years I've made hundreds of friends all over the world and from all walks of life is icing on the cake.

Like many of you, I was a crazy man in my early days of ham radio. If there was a contest going on during a given weekend, I was on the air and participating. I never missed the "majors," such as the CQ WW, ARRL SS, ARRL DX, etc. In fact, I remember operating from HI8 in the 1979 CQ WW DX SSB Contest, and then driving 400 miles (round-trip) the following weekend to W2PV and working the ARRL CW SS. Talk about going from high-speed racing to a walking around the block!

Some of you may recall the "old days" when ARRL DX contests were actually two weekends per mode. In retrospect, it was a bit strange—especially at the end of the first weekend. The contest was over for the weekend, but you still had another 48 hours of operating to complete before you knew how you ultimately did in the contest. I spent many of those weekends traveling to other stations to operate, as I didn't have a serious one of my own. Thus, whether it resulted in a trek to W2PV, W1ZM, or elsewhere, carpooling to the contest station was the order of the day. The result of all of that was there were many years when I literally drove to W2PV for four out of seven weekends in February and March—a total of 1600 miles and 192 hours of operating!

Then came kids, real jobs, the notion of having done it many times, and other factors. Most of us have been in this situation at one time or another in our lives. If not, eventually you will be there. Whenever you are as active in a hobby as I have been in ham radio, you ultimately start to ask yourself the question "Am I still having fun doing this?"

For many of us, as life progresses, the notion of weekend time takes on a new meaning. Friday evening is looming and we're beginning to wind down our crazy 50-hour (or more) workweek. We're tired and burned out, and frankly begin to wonder whether or not we really want to use that precious weekend break to sit in front of a radio and operate a contest. Now the question becomes more relevant to some of you: Are you indeed still having fun?

Whether you have a high-stress high-tech job or mercifully benefit from the advantages of collecting tolls on the Pennsylvania Turnpike, the decision to use your discretionary time to operate contests is a personal one based on the intent to have some fun while doing it. When you think about it, we truly do give up a lot to operate contests. We put aside time that can be used to catch up on rest, finances, family, and other activities, all for the sake of operating a radio station and repetitively exchanging numbers and information with people whom you often don't even know. It's a rather bizarre concept, when you think about it.

Now that I have 35 years of operating under my belt, I'm finding that one of the biggest challenges in contesting is maintaining that high level of motivation. In part, the challenge is based on the fact that over the years I've truly been blessed with opportunities to operate at some of the best contest stations in the world and with some of greatest operators I've ever seen. Deep down, though, I know that contesting is still in my blood and always will be. With that being said, let me share some of

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the ways I have found to keep the fun in contesting for me:

• Operate in different categories. In my case, I operated primarily single operator, all band for over 20 years. The thought of doing it yet again was starting to get tedious. It wasn't until I starting experiencing other operating categories again (for example, multi-single, multi-two, single band) that the true fun of the experience came back.

• Operate in different contests. It's easy to get in a rut and only operate in the top major contests. However, have you ever considered taking a break from the ARRL DX contest, for example, and spending that precious weekend time in the CQ WW WPX, or maybe the IARU contest in the summer?

• It's actually acceptable to simply operate a contest without a competitive goal in mind. All too often we feel compelled to operate a contest with the intent of trying to win something. After all, that's the point of it all, isn't it? In the February 2003 ARRL DX contest, I chose to return to K1EA's station (which is in the process of being rebuilt) and simply use whatever bands he had available—no pressure, no goal other than to have pure, unadulterated fun. If I was enjoying the opportunity of working Asia via long path on 40 meters in the morning when convention said I should be running Europe on 15 meters, I stayed on 40 meters. What a concept!

• Resist the pressure from your contest club to maximize your score at the expense of having fun and doing what *you* want to do. This will not be a popular concept for many people (especially contest club officers), but all too often we are encouraged to sponsor multi-ops or other classes of operation instead of what we would truly prefer—all in the spirit of helping the club. While there's a place for that as well in the grand scheme of things, I also believe there's a strong case that can be built for operating monoband 80 meters in the CQ WW because you really want to spend that year putting your brand new 4-square through its paces. For you, that's your idea of fun and that's great!

• Operate outside of your country. There's nothing that will rejuvenate an experienced contest operator more than taking a trip to the Caribbean or some other location and operating a contest. Many of you know that I've operated from PJ2T the past few years in the CQ WW DX SSB Contest. If you can't have fun in the Caribbean sun operating with a bunch of great guys, running stations at 300+ per hour, then the notion of contest fun needs to be looked at from a much more serious angle.

• Contesting is not just about operating. Enthusiasm for contesting can also come in the form of doing things for others. Try getting more involved with your local contest club. Offer your experience to others in the form of writing, speaking with local organizations, sharing your fun with youngsters—simply being a bit innovative.

• In a similar way, contesting is also about building stations and understanding technology. When was the last time you truly invested some serious time in understanding the latest in antenna theory and then put that into practice? Do you really understand some of the inexpensive ways other contesters are improving their stations, ways that you could benefit from as well? Is it time to really try to understand all of the idiosyncrasies of the computer invasion into contesting?

As the pressures of life play havoc with our time, it's important to never forget that ham radio is not only a hobby, but also an activity that is supposed to be *fun.* That's a perspective we can often lose sight of in the heat of battle.

Fortunately, the hobby is a boatload of fun, and I can honestly say that with a little proactive thinking on my part it continues to be for me as well. In my case, I still get an enormous kick out of running guys fast or working that 40-meter, low-power QSO in the early morning. When I broke the 400 QSO/hour barrier last year in the CQ WW DX SSB Contest, I was like a little kid. It was fun and another experience that I'll never forget. That's the key. It's been said that variety is the spice of life. It can be for contesting as well.

Final Comments

While my comments this month were a bit of a personal yarn, I hope that many of you could relate and will feel compelled to share your experiences with others. Above all, be sure to have fun!

That's all the time and space I have for this time around. See you next month!

73, John, K1AR

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propagation

BY TOMAS HOOD,* NW7US

Will Sporadic-*E* Open Early This Year?

A Quick Look at Current Cycle 23 Conditions

(Data is rounded to nearest whole number)

Sunspots
Observed Monthly, December 2003: 47
Twelve-month smoothed, June 2003: 65

10.7 cm Flux
Observed Monthly, December 2003: 115
Twelve-month smoothed, June 2003: 133

***Ap* Index**
Observed Monthly, December 2003: 17
Twelve-month smoothed, June 2003: 22

The sporadic-*E* (*Es*) season in the Northern Hemisphere took off with a bang early in 2003. The daily spots listed on DX spot reflectors (such as the DX Summit by OH2AQ <http://oh2aq.kolumbus.com/dxs/>) revealed *Es* activity starting as early as February 2003. Typically, *Es* propagation really heats up after April and is in full swing by June. Last year, FM and TV DXers reported signals on the low TV frequencies between locations such as Manitoba, Canada and Idaho, Colorado, Arizona, New Mexico, and as far south as Mexico (XHFA-TV). Will we see such early activity this year?

Sporadic-*E* propagation is an exciting but mostly unpredictable mode related to "clouds" of highly ionized, dense, small patches in the *E*-region of the ionosphere. Ten-meter operators have known *Es* propagation as the summertime "short skip." These "clouds" appear unpredictably, but they are most common over North America during the daylight hours of late spring and summer. *Es* events may last for just a few minutes up to several hours and usually provide an opening to a very small area of the country at any one time.

While there is still a great opportunity for a deeper exploration and understanding of *Es,* a lot has already been learned and observed since it was first discovered in the 1930s. *Es* is known to occur more frequently in latitudes nearer the Equator and peak near the solstices, but it is especially strong in the late spring through summer.

There are a handful of theories regarding how sporadic-*E* occurs and how it works. One theory suggests that weather, including the influence of ionospheric wind shear, plays a key role. Others suggest that meteors may trigger *Es*. What keeps scientists and amateurs digging through the evidence from on-the-air *Es*-mode two-way contacts is that none of the directly measurable theories have accurately held true in every observed opening. This leads us to believe that sporadic-*E* is complex and created by various unrelated conditions and phenomena.

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e-mail: <cq-prop-man@hfradio.org>

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for March 2004

Propagation Index.....	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 14-17, 20-21	A	A	B	C
High Normal: 1-3, 6-9, 13, 18-19, 22	A	B	C	C-D
Low Normal: 4-5, 10-12, 26-27, 30-31	B	C-B	C-D	D-E
Below Normal: 23-25	C	C-D	D-E	E
Disturbed: 2, 28-29	C-D	D	E	E

Where expected signal quality is:
A—Excellent opening, exceptionally strong, steady signals greater than S9.
B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D—Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.
2. With the *propagation index,* use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be good (B) on March 1st through the 3rd, fair to good (C-B) on the 4th and 5th, good (B) on the 6th through the 9th, etc.

Over the years, thousands of contacts via sporadic-*E* propagation have been logged on 50, 144, and 220 MHz (not to mention the great amount of supporting evidence from the reception logs of FM and TV station DX hobbyists). In July 1983, the first two-way transatlantic 50-MHz *Es* contacts were made between British and American stations. These contacts were made with only a few watts of RF and spanned the Atlantic Ocean. Since then, many contacts have been made between Hawaii and the east coast of North America, and Japan and the west coast. These proved that *Es* propagation is not limited to one-hop distances. Contacts spanning these great distances were not limited to 50 MHz, but were had on 144 MHz. Even 220 MHz has shown path distances of over 1500 km.

For an interesting discussion regarding normal *E*-layer propagation as compared to *Es,* see <http://www.uksmg.org/elayer.htm>. Also check out *CQ VHF* magazine for details regarding VHF propagation through the spring and summer.

Current Solar Cycle Progress

Every eleven years the activity of the Sun (as evidenced by the number of solar flares, coronal holes, and so forth) reaches a peak called the *solar maximum.* A period of quiet called the *solar minimum* occurs roughly five years later. During the solar maximum there are many sunspots, solar flares, and coronal mass ejections (CMEs), all of which can affect communications and weather here on Earth.

The current cycle, number 23, started in 1996. Two peaks have occurred: The monthly smoothed

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	10	10	10	9	8*	9	8	8	8	9**	10	10
1997	11	11	14	17	18	20	23	25	29	32	35	39
1998	44	49	53	57	59	62	65	68	70	71	73	78
1999	83	85	84	86	91	93	94	98	102	108	111	111
2000	113	117	120	121	119	119	120	119	116	114	113	112
2001	109	104	105	108	109	110	112	114	114	114	116	115
2002	114	115	113	111	109	106	103	99	95	91	85	82
2003	81	79	74	70	68	65	*62*	*60*	*59*	*57*	*55*	*52*
2004	*48*	*44*	*41*	*38*	*35*	*32*	*30*	*28*	*27*	*25*	*24*	*22*
2005	*21*	*20*	*18*	*17*	*16*	*15*	*14*	*13*	*12*	*12*	*11*	*10*
2006	*10*	*9*	*8*	*8*	*8*	*7*	*7*	*7*	*7*	*6*	*6*	*5*
2007	*5*	*6*	*6*	*6*	*7*	*8*	*10*	*11*	*13*	*16*	*18*	*21*

**May 1996 marks Cycle 23's mathematical beginning.*
*** October 1996 marks the beginning of Cycle 23 according to a consensus of scientists, which NGDC is now using.*
Italics indicate predicted values.
***Note:** The end of Cycle 23 will be sometime between December 2006 and February 2007.*

Table I– Smoothed sunspot numbers for Cycle 23.

sunspot number first peaked at 120.8 during April 2000, with a second, yet lower peak, at 115.6 for November 2001. Since these two peaks, we have seen a steady decline in the cycle's activity. After subtracting the four years from the 1996 beginning to the peak during 2000, and then subtracting the last three years, we have roughly three to four years left of this eleven-year cycle, which should end during the end of 2006 or during the beginning of 2007 (refer to Table I).

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 115 for December 2003, down significantly from November's 153. The twelve-month smoothed 10.7-cm flux centered on June 2003 is 133, just a couple of points down from May. The predicted smoothed 10.7-cm solar flux for March 2004 is about 102, give or take about 17 points.

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for December 2003 is 47, down from November's 67. The twelve-month running smoothed sunspot number centered on June 2003 is 65, down a bit from May. The lowest daily sunspot value during December 2003 was recorded on both December 9 and 31 with a count of 16. The highest daily sunspot count for December was 98 on December 1. A smoothed sunspot count of 57 is expected for March 2004.

The observed monthly mean planetary *A*-index (*Ap*) for December 2003 is 17, much quieter than November's 31. The twelve-month smoothed *Ap*-index centered on June 2003 is 22, up a point from May. Expect the overall geomagnetic activity to be active to disturbed during March.

March Propagation

March is one of the optimal DX months. As the Spring Equinox approaches, the gray line begins to run straight north and south. With the return of sunlight to the polar north, the higher HF bands are improving quickly.

Ten meters will be spotty, with the most reliable propagation along north/south paths, while occasional strong but short openings will occur between stations on east/west paths into Asia and Europe. These paths will quickly disappear as we move into April, so don't miss out.

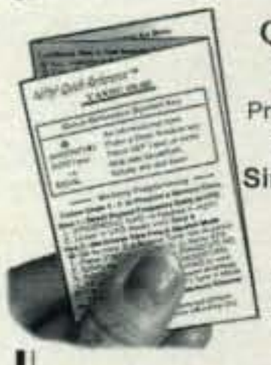
Fifteen meters will be much more usable than 10. We will find 15 staying open longer into the evenings, being the band of choice as we move through the month and into April. Daytime paths will not degrade much until midsummer. You will see more early closures if you live closer to the North Pole.

Seventeen and 20 meters will remain in good shape. Both short- and long-path circuits are reliable and solid. All nighttime paths are wide open during March. Primetime evening hours in the United States are sunrise hours across Russia, Africa, and both the Near and Far East. Expect a lot of short- and long-path DX into these areas of the world.

Between sunset and midnight, expect DX openings on all bands between 20 and 160 meters, with occasional openings on 15 and 17 when conditions are High or Above Normal. Conditions on 30, 40, 60, 80, and 160 meters should favor openings to the east and south. These bands should peak for openings to Europe and Africa near midnight.

From midnight to sunrise, expect optimum DX conditions on 30, 40, 60, 80, and occasionally 160 meters. Condi-

Radio Setup Helpers



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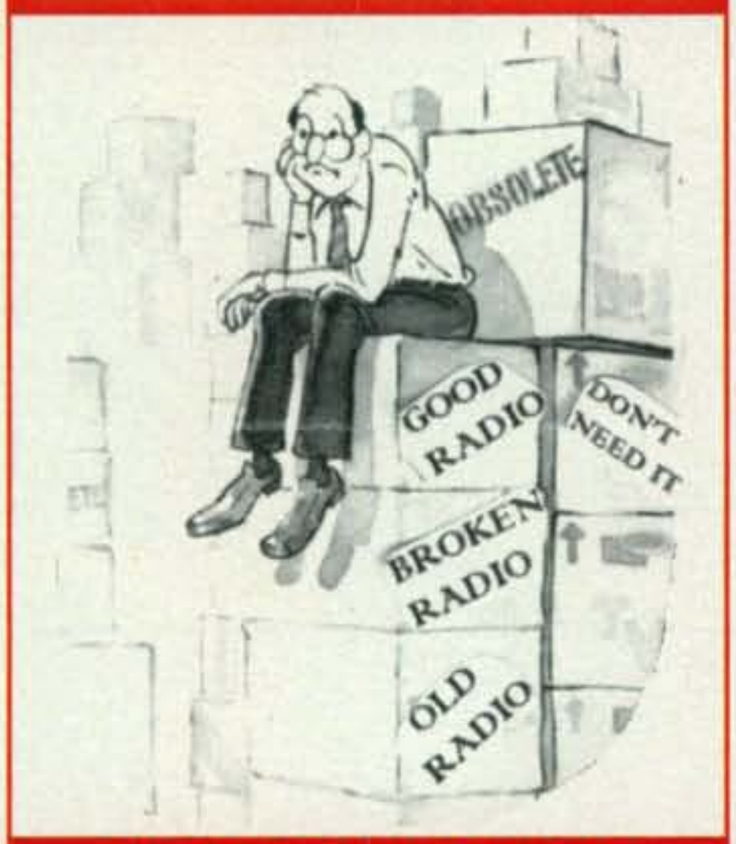

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HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 80 meter openings.

2. The propagation index is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. In the Short-Skip Chart appropriate *standard* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between New York and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 PM in Los Angeles; 17 or 5 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 KW PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Chart
March & April 2004
Band Openings Given In Local Standard Time At Path Mid-Point (24-Hour Time System)

Band (Meters)	*Distance From Transmitter (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-230*
10	Nil	Nil	08-19 (0-1)	08-13 (1-0) 13-16 (1) 16-19 (1-0)
15	Nil	08-16 (0-1)	09-12 (1) 12-17 (1-2) 17-18 (0-1)	08-09 (0-1) 09-10 (1) 10-13 (1-2) 13-14 (2) 14-17 (2-3) 17-18 (1-2) 18-20 (0-1)
20	Nil	07-08 (0-1) 08-09 (0-2) 09-14 (0-3) 14-16 (0-2) 16-23 (0-1)	07-08 (1) 08-09 (2) 09-10 (3) 10-14 (3-4) 14-16 (2-4) 16-18 (1-4) 18-19 (1-3) 19-20 (1-2) 20-23 (1) 23-05 (0-1)	06-07 (0-1) 07-08 (1-2) 08-09 (2-3) 09-10 (3) 10-15 (4-3) 15-18 (4) 18-19 (3) 19-20 (2-3) 20-21 (1-2) 21-05 (1) 05-06 (0-2)
40	07-09 (0-1) 09-10 (0-2) 10-12 (2-3) 12-17 (3-4)	06-07 (0-2) 07-09 (1-4) 09-10 (2-4) 10-15 (4-3)	06-07 (1) 07-08 (4-2) 08-15 (3-1) 15-17 (4-2)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1)
	17-19 (2-3) 19-20 (1-2) 20-22 (0-1)	15-17 (4) 17-19 (3-4) 19-20 (2-4) 20-22 (1-2) 22-00 (0-2) 00-06 (0-1)	17-19 (4-3) 19-20 (4) 20-22 (2-4) 22-00 (2-3) 00-06 (1-2)	17-19 (3-2) 19-21 (4-3) 21-22 (4) 22-00 (3-4) 00-02 (2-3) 02-06 (2)
80	07-08 (2-3) 08-11 (3-4) 11-18 (4) 18-20 (3-4) 20-22 (2-3) 22-00 (1-2) 00-06 (1) 06-07 (1-2)	07-08 (3-2) 08-11 (4-1) 11-16 (4-0) 16-18 (4-2) 18-20 (4-3) 20-22 (3-4) 22-00 (2-4) 00-06 (1-2) 06-07 (2)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-00 (4) 00-05 (2-3) 05-07 (2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-00 (4-3) 00-05 (3) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2)	05-06 (0-1) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

ALASKA
March & April 2004
Openings Given in GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	Nil	22-00 (1)	22-00 (1) 00-02 (2) 02-04 (1)	06-13 (1) 07-12 (1)*
Central USA	Nil	20-22 (1) 22-00 (2) 00-01 (1)	22-00 (1) 00-03 (2) 03-05 (1)	07-09 (1) 09-12 (2) 12-14 (1) 07-12 (1)*
Western USA	Nil	20-22 (1) 22-00 (2) 00-03 (1)	19-22 (1) 22-00 (2) 00-02 (3) 02-04 (2) 04-06 (1)	06-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-15 (1) 08-10 (1)* 10-12 (2)* 12-14 (1)*

HAWAII
March & April 2004
Openings Given in Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	Nil	08-11 (1) 11-13 (2) 13-14 (3) 14-15 (2) 15-16 (1)	02-05 (1) 05-07 (2) 07-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-21 (1)	18-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-03 (1) 19-21 (1)* 21-00 (2)* 00-02 (1)*
Central USA	11-15 (1)	08-09 (1) 09-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	00-05 (1) 05-08 (2) 08-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-19 (1) 19-21 (2) 21-01 (3) 01-04 (2) 04-05 (1) 19-21 (1)* 21-01 (3)* 01-02 (2)* 02-03 (1)*
Western USA	11-15 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	02-04 (1) 04-06 (2) 06-09 (4) 09-11 (3) 11-13 (2) 13-15 (3) 15-17 (4) 17-19 (3) 19-21 (2) 21-23 (1)	17-19 (1) 19-20 (2) 20-23 (4) 23-05 (3) 05-06 (2) 06-07 (1) 19-20 (1)* 20-21 (2)* 21-04 (3)* 04-05 (2)* 05-06 (1)*

**Indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.*
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

Propagation charts prepared by George Jacobs, W3ASK.

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tions should favor openings toward the west and south. Some rather good 20-meter openings should also be possible toward the south and west during this time.

Daytime MUFs continue to drop and the *Ap* is on the rise, so take advantage of the current excellent conditions, and work the world!

VHF Ionospheric Openings

The possibilities for ionospheric openings on the VHF bands usually improve during March and the spring months. Many of the solar-ionospheric relationships that can produce ionospheric openings on the VHF bands tend to maximize during equinoctial periods.

A seasonal increase in short-skip openings due to sporadic-*E* propagation generally takes place during March, and an occasional 6-meter opening may be possible during this month. Sporadic-*E* openings most often occur during the daylight hours over distances between about 1000 and 1400 miles. There is also a good chance for an increase in widespread auroral activity during March, accompanied by auroral-scatter-type openings on 6 and 2 meters. Check the Last-Minute Forecast at the beginning of this column for those days in March that are expected to be Below Normal or Disturbed. These are days on which auroral activity is most likely to occur.

Conditions should be optimal during March for trans-equatorial scatter propagation between the southern tier states and countries deep in South America. The best time for TE openings should be between 8 and 11 PM local time. Don't forget to check out the *CQ VHF* magazine for more details on VHF propagation and conditions.

In Closing

I thank those of you who have taken the time to write to me. I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. I also welcome corrections and clarifications. You may e-mail me, write me a letter, or catch me on the HF amateur bands. I also have an EchoLink node where you might catch me; look for node number 152783, NW7US-L. I also invite you to participate in my online propagation discussion forum at <http://hfradio.org/forums/>. Don't forget to check out the NW7US Propagation Center at <http://prop.hfradio.org/>. I look forward to hearing from you. Happy DXing!

73, Tomas, NW7US/AAMØEWA

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Results *(from page 22)*

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

CW RESULTS

QRP/p

FY5FY	**A**	**2,359,486**	**1374**	**554**
TI5N	**A**	**1,596,114**	**1239**	**494**
			(Op: W8QZA)	
HG5Z	**A**	**1,361,876**	**1160**	**524**
YT7TY	**A**	**1,202,248**	**1124**	**536**
SM3C	**A**	**690,404**	**858**	**442**
			(Op: SM5CCT)	
LY3BY	**A**	**557,004**	**800**	**399**
N7IR	**A**	**469,812**	**610**	**357**
GW4ALG	**A**	**397,488**	**637**	**336**
G3YMC	**A**	**382,410**	**665**	**315**
GØDCK	*	359,597	561	329
AM7AAW	**A**	**351,571**	**538**	**341**
DL1ARJ	**A**	**318,954**	**541**	**318**
G3KKQ	*	313,800	525	300
ZS6DX	**A**	**295,800**	**355**	**255**
MØO	*	232,724	458	292
			(Op: G4JZO)	
ES1RF	**A**	**217,674**	**394**	**261**
DF1DX	*	204,315	397	265
RV3LO	**A**	**174,503**	**319**	**257**
PAØADT	**A**	**172,900**	**381**	**260**
W8VE	**A**	**171,600**	**371**	**240**
N4HY	**A**	**163,240**	**311**	**212**
DL1LAW	*	144,728	407	229
UX8IX	**A**	**133,354**	**361**	**223**
K9BWI	**A**	**128,480**	**291**	**220**
VE3RSA	**A**	**124,250**	**237**	**175**
RZ9IB	**A**	**117,696**	**273**	**192**
UZ5UA	*	108,824	336	223
WA8REI	*	102,238	358	194
VA3SB	*	100,016	237	152
HB9DSU	**A**	**89,595**	**246**	**181**
RV3LQ	*	87,980	246	212
WB6BWZ	*	70,224	296	154
LA5EKA	**A**	**67,881**	**238**	**187**
F6FTB	**A**	**55,774**	**205**	**158**
W3BBO	**A**	**47,748**	**197**	**138**
VE7IN	**A**	**47,280**	**157**	**120**
SP9MRQ	**A**	**45,114**	**191**	**146**
UA4ANZ	*	44,460	169	130
UY2RZ	*	43,030	154	130
K5UV	**A**	**41,272**	**208**	**134**
LZ4AE	*	41,160	161	140
PA3FSC	*	32,750	172	131
KX7L	**A**	**28,490**	**157**	**110**
UR5FCM	*	23,904	115	96
N7XY	*	22,542	122	102
KZ2G	*	21,384	100	81
UU9JQ	*	21,255	125	109
WØETC	**A**	**20,400**	**111**	**100**
UA4YJJ	*	19,511	127	109
K9FOH	*	16,536	84	78
LZ5PL	*	16,560	108	90
DF5RF/P	*	16,199	114	97
DL2BQD	*	13,770	95	85
DJ5QK	*	13,502	157	86
W5KDJ	*	12,749	76	61
F8BDQ	*	11,837	108	89
DL1JBE	*	11,316	96	82
UA4ARL	*	9,860	70	68
YO4RLP	**A**	**8,056**	**82**	**76**
KL7FDQ/NO7	*	4,539	61	51
VK3JS	**A**	**4,028**	**49**	**38**
HB9AYZ	*	3,834	61	54
JA1GTF	*	2,678	33	26
USØYA	*	2,494	32	29
IT9GXE	**A**	**2,254**	**49**	**46**
JJ1LRD	*	756	20	18
KV6T	*	91	7	7
EW6CU	**28**	**12,194**	**110**	**91**
JR3RWB	**28**	**10,512**	**80**	**72**
DL9NEI	**28**	**5,865**	**79**	**69**
PY4PW	**28**	**2,139**	**31**	**31**
DK3WW	*	1,890	43	42
PY2FRW	*	697	17	17
JK3ZQJ	*	406	15	14
			(Op: JG1EIQ)	
JA1PTO	*	220	12	11
RZ6HX	**21**	**268,256**	**484**	**332**
YU1LM	**21**	**207,603**	**391**	**297**
ES1CR	**21**	**76,245**	**245**	**195**
G2HLU	**21**	**42,340**	**168**	**146**
JR1NKN	**21**	**32,922**	**129**	**118**
WA6FGV	**21**	**31,242**	**174**	**127**
HB9CPS	**21**	**29,260**	**128**	**110**
AE9F	**21**	**25,538**	**133**	**113**
T94OM	**21**	**23,320**	**140**	**110**
OK1AIJ	**21**	**16,400**	**114**	**100**
OL4W	**14**	**291,489**	**523**	**363**
			(Op: OK1IF)	
G3LHJ	**14**	**225,600**	**398**	**300**
UN7CN	**14**	**221,364**	**334**	**258**
WA8WV	**14**	**199,185**	**321**	**271**
OK1DSA	*	180,516	402	307
9A3GU	**14**	**175,460**	**354**	**283**
SMØGNS	**14**	**171,390**	**407**	**290**
SV1NA	**14**	**152,328**	**361**	**264**
NU4B	**14**	**137,080**	**298**	**230**
W6YJ	**14**	**108,216**	**256**	**216**
SP9NSV	**14**	**61,305**	**233**	**183**
US1RCH	**14**	**53,222**	**213**	**178**
SN8M	*	45,540	170	165
VE3IGJ	**14**	**29,866**	**131**	**109**
SP3VT	*	29,475	149	131
LA8WG	"	**25,935**	**159**	**133**
KØEX	**14**	**5,859**	**71**	**63**
RA3XEV	**14**	**3,948**	**50**	**47**
HB9LDO	**14**	**2,352**	**42**	**42**
EA4OA	**14**	**1,890**	**50**	**27**
JH8FAJ/7	*	819	25	21
PB4FUN	*	462	22	21
S54AA	**7**	**485,298**	**486**	**342**
OK1IR	**7**	**275,892**	**378**	**277**
RW6HX	**7**	**220,274**	**308**	**241**
7S3J	**7**	**157,680**	**296**	**216**
			(Op: SMØDZH)	
US5QQF	**7**	**132,600**	**280**	**200**
OK1TGI	7	92,394	230	174
SP5OXJ	**7**	**79,540**	**204**	**164**
F5JDG	**7**	**10,176**	**75**	**64**
W1CVE	**7**	**9,348**	**58**	**57**
N2JNZ	**7**	**8,296**	**84**	**61**
NE6M	**7**	**5,220**	**49**	**45**
OM3THV	**3.5**	**113,263**	**275**	**191**
SP4TBM	**3.5**	**12,750**	**86**	**75**
US8IBS	**3.5**	**8,437**	**66**	**59**
AN3CKX	**3.5**	**3,456**	**38**	**36**

SINGLE OPERATOR

UNITED STATES

WC1M	**A**	**5,656,144**	**2472**	**766**
K3NA	**A**	**5,376,540**	**2257**	**732**
NU1P	**A**	**3,434,165**	**1913**	**655**
			(Op: K1MK)	
K5MA	*	3,300,509	1772	641
K5ZD	*	2,293,522	1363	583
NT1N	*	1,077,300	949	475
K1YA	*	57,120	195	140
AE1D	*	1,740	35	30
KC1XX	**14**	**3,148,370**	**1786**	**745**
			(Op: K1GQ)	
KG1D	**7**	**2,999,854**	**1225**	**617**
			(Op: K1KI)	
KT1V	**7**	**1,964,955**	**992**	**505**
K1VW	**3.5**	**140,086**	**286**	**178**
***NN5P**	**A**	**1,726,776**	**1299**	**522**
			(Op: N1UR)	
***KS1J**	**A**	**1,243,150**	**1046**	**470**
***K1HT**	**A**	**1,010,080**	**852**	**428**
*KQ1F	*	492,785	620	335
			(Op: K1XM)	
*WR1TE	*	197,175	375	239
			(Op: W1JQ)	
*AB1BX	*	118,236	274	177
*W1EZ	*	83,470	235	170
*K1SWG	*	49,126	147	121
*KK1W	*	18,426	95	83
*K1EP	*	6,808	50	46
*AA1M	*	5,712	50	48
***KG1V**	**28**	**1,794**	**27**	**26**
***K1RDD**	**14**	**19,668**	**149**	**132**
KD2RD	**A**	**3,326,227**	**1944**	**647**
W2RE	**A**	**3,104,829**	**1791**	**663**
			(Op: WA2GO)	
N2GC	**A**	**1,952,190**	**1279**	**545**
KA2MGE	*	1,327,149	1082	501
NJ2NJ	*	1,263,920	1061	488
			(Op: AA5B)	
K2SX	*	715,384	788	401
W2OO	*	592,233	601	339
W2LE	*	213,607	339	227
N2CU	*	101,442	251	174
W2FUI	*	91,460	225	170
N2AA	**14**	**3,283,892**	**1847**	**746**
***WB2AA**	**A**	**1,075,635**	**1006**	**451**
***K2UF**	**A**	**753,300**	**762**	**405**
***N3KCJ**	**A**	**381,440**	**484**	**298**
*K2SZ	*	305,244	388	278
*WW2J	*	242,840	409	260
*W2EZ	*	208,170	356	257
*WA2VQV	*	164,400	298	240
*KD2HE	*	145,406	342	218
*W2GDJ	*	127,000	278	200
*WA2IAU	*	91,686	253	177
*NW2J	*	66,976	221	161
*N2CG	*	37,752	119	88
*K2YLH	*	34,336	144	116
*WB2ART	*	20,250	120	90
*W2RDS	*	19,040	94	80
*N2FF	*	7,257	68	59
*N4TW	*	396	18	18
***W2/UR5DEM**	**14**	**1,216,047**	**976**	**553**
*NS2P	*	544	16	16
K3CR	**A**	**5,576,550**	**2585**	**791**
			(Op: LZ4AX)	
AA3B	**A**	**3,979,728**	**2056**	**696**
K3ZO	**A**	**3,920,255**	**2043**	**685**
WR3Z	*	3,552,400	1969	664
K2PLF	*	2,722,896	1654	648
N3UM	*	1,668,615	1308	559
N3OC	*	977,850	1001	450
N3AM	*	789,360	753	390
W3AZ	*	613,704	554	364
W3BYX	*	257,040	418	272
N3NZ	*	96,660	264	179
N3KN	*	57,387	175	141
AA3VA	*	24,045	129	105
AA3TL	*	7,686	68	61
KD4D	**21**	**2,268,332**	**1461**	**682**
WA3AAN	**14**	**57,600**	**203**	**160**
W3AP	**7**	**51,956**	**160**	**124**
***K3WW**	**A**	**3,050,916**	**1658**	**638**
***NY3A**	**A**	**2,052,155**	**1426**	**595**
***K3NK**	**A**	**1,084,713**	**1013**	**471**
*AI3M	*	397,065	640	309
*W3MC	*	312,472	445	278
*K2YWE	*	293,440	469	280
*AAØCY	*	145,507	305	227
*K3EGE	*	138,798	301	198
*N3HCN	*	117,366	290	186
*WA3KYY	*	116,816	272	196
*NN9G	*	54,672	203	134
*W3CB	*	51,051	182	143
*N3XL	*	39,406	174	122
*AB3AI	*	31,248	161	112
*K3JHT	*	6,741	71	63
*W3FQE	*	3,774	40	34
***K3VA**	**14**	**37,632**	**141**	**128**
*W3CP	7	378	9	9
NE4AA	**A**	**7,547,408**	**3156**	**836**
			(Op: K1TO)	
W4MYA	**A**	**4,916,856**	**2525**	**777**
NK4A	**A**	**4,160,688**	**2278**	**784**
WC4E	*	3,995,280	2250	716
WZ5V	*	2,981,356	1953	686
			(Op: KØEJ)	
WR3O	*	2,888,900	1987	700
			(Op: K4RO)	
W1MO	*	1,956,636	1498	594
NJ4I	*	1,614,820	1437	526
			(Op: K4LTA)	
W4QM	*	1,584,828	1245	532
W4YE	*	1,497,020	1081	518
K4BAI	*	1,295,796	1311	498
WF3J	*	1,010,040	885	456
WW4CW	*	512,316	603	342
			(Op: K4WJ)	
KO1N	*	480,080	609	353
W4TNX	*	336,640	549	320
W4NZ	*	235,170	408	270
WC4VA	*	210,338	310	251
			(Op: K4EC)	
N4UH	*	201,360	322	240
KA1DWX	*	144,572	236	188
N4MM	*	96,800	199	176
W4PA	*	19,481	86	77
K4OAQ	**21**	**961,920**	**959**	**480**
K1UM	*	358,440	510	348
WW4R	**14**	**2,907,359**	**1823**	**743**
			(Op: K4WX)	
KØCOP	*	70,281	176	171
W4ZYT	*	6,288	48	48
K4SV	**7**	**403,221**	**410**	**273**
***WD4AHZ**	**A**	**1,504,126**	**1325**	**533**
***K4OGG**	**A**	**1,489,334**	**1319**	**509**
***WJ9B**	**A**	**1,410,643**	**1187**	**491**
*WO4O	*	1,396,560	1338	552
*NA4K	*	1,250,970	1244	483
*NR3X	*	1,132,404	1062	476
			(Op: N4YDU)	
*KG4FPJ	*	984,753	969	441
			(Op: N4GI)	
*KW4CW	*	815,654	816	406
			(Op: W4SAA)	
*W9WI	*	700,948	1018	401
*K4EU	*	544,608	668	366
*NF4A	*	536,284	654	358
*K4FK	*	365,050	414	350
			(Op: K9AW)	
*K3IE	*	359,252	490	326
*W7GAM	*	326,029	453	277
*N4PSE	*	320,530	421	266
*WO4D	*	303,875	508	275
*W2YE	*	292,008	436	276
*W4NBS	*	184,756	375	247
*K4AMC	*	173,116	400	226
*N4NTO	*	157,740	334	220
*KB4N	*	150,164	296	217
*WW2DDM	*	116,892	292	191
			(Op: K4UK)	
*W4HZD	*	109,632	283	192
*W4TYU	*	106,860	316	195
*AE4Y	*	99,731	323	181
*K9HUY	*	89,996	190	151
*K4GA	*	58,408	212	149
*K4SAC	*	51,375	210	137
*K4BEV	*	39,627	174	119
*NN4DF	*	33,604	143	124
*W4NTI	*	28,363	137	113
*K4BX	*	22,578	133	106
*AE4EC	*	17,949	120	93
*K6ETM	*	17,160	102	88
*W4YA	*	10,416	62	56
*N3BF	*	10,050	73	67
*AB4RL	*	9,164	64	58
*N4XPX	*	3,431	47	47
			(Op: N4NTO)	
*K3MZ	*	2,790	31	30
*K4FTO	*	1,073	33	20
*W4OGG	*	702	35	13
***KN4Y/M**	**28**	**1,568**	**38**	**32**
***WB4TDH**	**21**	**345,092**	**517**	**341**
***NO4S**	**7**	**583,646**	**504**	**329**
*W4IDX	*	119,483	247	169
*WK4Y	*	95,316	204	156
NT5C	**A**	**4,386,816**	**2526**	**768**
			(Op: N3BB)	
KT5I	**A**	**3,598,175**	**2215**	**725**
			(Op: K5PI)	
W5WMU	**A**	**2,303,854**	**1768**	**623**
KZ5D	*	1,972,500	1646	625
KW5DX	*	1,417,647	1357	561
			(Op: K1LL)	
NN5ZZ	*	1,226,112	1255	496
			(Op: N5LZ)	
N5PO	*	1,208,207	1134	497
N6ZZ	*	1,164,735	1134	495
W5EKF	*	858,600	1013	424
K5KA	*	466,920	754	360
K5ZO	*	345,828	634	322
NE5D	**28**	**225,500**	**528**	**275**
			(Op: K5RX)	
NX5M	**21**	**1,528,956**	**1325**	**594**
			(Op: UAØOFF)	
K2BA	**21**	**966,273**	**969**	**517**
W5OT	*	256,928	527	296
			(Op: WA5TWL)	
N4OGW	**14**	**2,373,360**	**1610**	**696**
W5FO	*	104,535	251	207
N5KA	*	76,791	197	179
***KG5U**	**A**	**1,633,263**	**1446**	**563**
			(Op: K5WA)	
***WD5K**	**A**	**1,311,106**	**1195**	**538**
***N5DO**	**A**	**1,182,483**	**1191**	**477**
*W5ZL	*	351,000	537	312
*NI5F	*	183,964	399	226
*NQ5K	*	161,238	445	231
			(Op: W5ASP)	
*KT5E	*	157,542	419	242
*K5WAF	*	106,960	285	191
*N5IJE	*	50,170	200	145
*N5PU	*	44,200	178	130
*K5GM	*	34,428	133	114
***K5WW**	**28**	**1,155**	**21**	**21**
KU6W	**A**	**5,611,993**	**2707**	**841**
			(Op: N6MJ)	
NE6N	**A**	**4,321,746**	**2373**	**759**
			(Op: N6RT)	
NR6O	**A**	**2,721,998**	**1849**	**661**
N6CW	*	2,010,280	1377	580
N6AA	*	1,601,932	1215	557
KF6RIP	*	989,520	1095	434
K1LU	*	988,176	1126	476
NF6A	*	950,478	789	471
			(Op: K6XX)	
N6HC	*	942,837	960	417
NZ6K	*	788,892	914	389
			(Op: K6RB)	
K6LRN	*	720,720	780	429
WR6M	*	579,255	646	365
N6TW	*	338,960	537	304
WT6TT	*	313,742	577	286
			(Op: N6NZ)	
KI6T	*	303,646	491	287
K6GT	*	230,725	463	275
WO6M	*	180,810	373	246
NC6CC	*	150,591	431	213
			(Op: N6ZFO)	
W6KC	*	87,291	267	183
KE6ZSN	*	73,788	291	172
WA6BOB	*	64,970	253	146
AJ6V	*	62,094	220	158
K6NA	*	55,860	197	140
W6FRH	*	55,755	189	135
W6ISO	*	37,642	141	118
NO6X	*	34,832	151	112
WA6URY	*	21,576	103	93
NC6M	*	10,368	96	72
			(Op: W7SW)	
KYØW	*	1,566	28	27
			(Op: WØYK)	
W6VNR	**28**	**1,794**	**27**	**26**
W6RKC	**21**	**36,375**	**140**	**125**
W6ISQ	*	3,504	49	48
NT6K	**14**	**253,005**	**599**	**303**
WM6A	*	185,962	359	259
			(Op: K6TA)	
K6NY	*	178,486	330	266
K6OY	**3.5**	**153,940**	**321**	**172**
***N6NF**	**A**	**1,041,846**	**1128**	**494**
***WN6K**	**A**	**822,339**	**989**	**399**
***WX6V**	**A**	**481,488**	**736**	**336**
*N6EM	*	221,250	416	250
*N6YEU	*	132,840	268	216
*K6DGW	*	116,800	337	200
*WDØAVV	*	109,200	308	200
*WW6D	*	104,400	264	180
*W8KIE	*	97,240	298	170
*AA6EE	*	91,440	277	180
*K6OWL	*	80,828	260	167
*W6SJ	*	65,664	241	152
*N6GL	*	61,408	228	152
*WA6OGO	*	58,216	253	152
*KE6QR	*	51,891	217	147
*K6CSL	*	51,165	201	135
*ND6E	*	41,406	138	134
			(Op: K6EP)	
*W7SW	*	38,052	151	126
*W6YL	*	29,232	156	116
			(Op: W6CT)	
*K6KIN	*	15,810	105	85
*NK6A	*	10,658	94	73
*KI6OY	*	4,224	64	48
***K6EY**	**21**	**7,502**	**75**	**62**
***W6NKR**	**14**	**97,318**	**224**	**197**
***AK6R**	**7**	**135,707**	**286**	**169**
*KU6T	*	14,007	75	69
KN7NV	**A**	**2,806,939**	**1628**	**641**
			(Op: K7NV)	
AC7LX	**A**	**810,570**	**980**	**410**
W7QN	**A**	**346,150**	**614**	**322**
K7VI	*	191,664	455	242
KS7T	*	119,192	285	188
NR7DX	*	107,200	262	200
KC7UP	*	24,288	105	92
K7ZZ	**14**	**1,257,149**	**1124**	**557**
W7AYY	*	16,948	223	76
K7WP	**7**	**390,420**	**454**	**270**
NM7I	*	149,175	388	195
			(Op: K7ON)	
K7OX	*	35,595	166	113
***KI7Y**	**A**	**429,072**	**638**	**336**
***AB7RW**	**A**	**266,688**	**471**	**288**
***AE7EE**	**A**	**131,320**	**397**	**196**
*N7ZN	*	56,420	206	140
*W7GTO	*	52,311	195	141
*NW7DX	*	44,032	207	128
*W7ZMD	*	31,392	129	109
*W7YS	*	22,365	138	105
*N7JO	*	14,872	124	88
*N6PZ	*	11,072	68	64
*N7EIE	*	10,640	100	76
*W7AJK	*	7,700	70	55
***NG7Z**	**21**	**48,792**	**204**	**152**
***K8IA**	**14**	**905,465**	**875**	**505**
*N7WA	*	61,074	184	162
***N7MAL**	**7**	**69,708**	**203**	**148**
*N7BV	*	29,682	129	102
***W7DRA/7**	**3.5**	**4,025**	**53**	**35**
K2UOP	**A**	**1,418,064**	**1170**	**496**
K8OQL	**A**	**918,778**	**985**	**434**
W8GN	**21**	**21,854**	**127**	**98**
N8II	**14**	**1,001,070**	**885**	**490**
***KT8X**	**A**	**2,027,355**	**1697**	**605**
			(Op: W8MJ)	
***KV8Q**	**A**	**845,614**	**933**	**418**
***K3JT**	**A**	**538,016**	**666**	**391**
*K8IR	*	532,532	679	364
*WB8TLI	*	412,446	506	318
*W8PN	*	213,180	441	255
*KG8GW	*	73,296	213	144
*NA8M	*	22,764	92	84
*K8GT	*	5,074	45	43
***W8IQ**	**14**	**15,876**	**86**	**81**
***AA8R**	**7**	**20,230**	**97**	**85**
KS9K	**A**	**2,899,548**	**1858**	**674**
			(Op: N4TZ)	
W9RE	**A**	**1,769,600**	**1240**	**553**
W9OP	**A**	**1,233,628**	**1077**	**506**
W9VA	*	131,182	308	214
K7EG	*	105,072	234	199
K9NW	**14**	**2,729,272**	**1685**	**728**
NR9J	**14**	**2,061,387**	**1436**	**681**
			(Op: N9TK)	
W9YYG	*	724,584	816	456
W9SE	**7**	**201,942**	**367**	**234**
***KK9A**	**A**	**2,782,800**	**1700**	**720**
***WT9U**	**A**	**345,247**	**622**	**301**
***K9IG**	**A**	**240,567**	**356**	**267**
*W9OA/9	*	122,696	235	196
*KA9F	*	99,703	259	179
*KB9YOZ	*	44,671	174	131
*W9AEM	*	24,888	104	102
*KJ9D	*	15,840	114	88
			(Op: WN9O)	
*K9PLX	*	4,029	59	51
***N2GM**	**21**	**215,646**	**376**	**283**
*K9WA	*	26,450	140	115
***K9BG**	**14**	**707,332**	**729**	**454**
*K9QH	*	574	14	14
***KX9DX**	**3.5**	**2,680**	**52**	**40**
KQ7M	**A**	**2,191,266**	**1816**	**651**
			(Op: N2WW)	
KOØU	**A**	**2,040,129**	**1661**	**611**
K9WIE/Ø	**A**	**1,268,798**	**1115**	**523**
WØGG	*	870,012	936	468
KTØR	*	437,540	673	334
WØHW	*	315,520	495	290
KØJPL	*	255,266	505	283
WØTY	*	110,112	303	186
K2VV	**14**	**2,469,962**	**1571**	**722**
KØDEQ	*	456,580	613	370
KU1CW	**7**	**952,614**	**793**	**414**
N5OE	*	18,912	156	96
***KEØUI**	**A**	**407,664**	**614**	**342**
***WØUY**	**A**	**383,292**	**535**	**324**
***KØCF**	**A**	**248,114**	**466**	**262**
*WØRT	*	128,700	244	198
*KØAXU	*	127,719	361	207
			(Op: KØGSV)	
*KØRWL	*	122,816	386	202
*WAØIYY	*	55,535	238	145
*AE9B	*	30,876	190	124
*NO2D	*	26,768	139	112
*KØHW	*	9,900	90	66
*KØEWS	*	8,856	99	72
*K2HT	*	4,380	34	30
***WØETT**	**14**	**239,856**	**409**	**304**
***KØRI**	**7**	**58,088**	**173**	**137**

NORTH AMERICA

BARBADOS

8P1A	**A**	**11,021,020**	**3885**	**857**
			(Op: W2SC)	

DOMINICA

J7A	**A**	**8,367,519**	**3325**	**859**
			(Op: K5KG/J75KG)	

PUERTO RICO

***KP4JRS**	**A**	**1,026**	**21**	**19**

COSTA RICA

TI3TLS	**14**	**1,537,000**	**1159**	**530**

CANADA

VY2TT	**A**	**7,309,631**	**2865**	**791**
			(Op: K6LA)	
VC1R	**A**	**6,900,984**	**2770**	**774**
			(Op: AE6Y @ VE1JF)	
CK3AT	**A**	**5,058,000**	**2360**	**750**
CK3DZ	*	1,943,397	1250	543
			(Op: VE3DZ)	
CK3EJ	*	1,664,576	1065	496
			(Op: VE3EJ)	
VO1MP	**A**	**800,800**	**642**	**350**
VE3RM	*	656,208	661	372
VE3GLA	*	189,711	311	197
VA3EC	*	82,593	196	161
VE7VR	**A**	**56,758**	**163**	**118**
CK3KZ	**21**	**1,170,932**	**936**	**497**
			(Op: VE3KZ)	
VC6A	**14**	**3,560,505**	**1870**	**741**
			(Op: VA7RR)	
***VE3ANX**	**A**	**1,907,223**	**1278**	**509**
*VE3KP	*	1,394,172	1007	468
*VE3NE	*	963,630	760	387
***VE7XF**	**A**	**837,060**	**729**	**420**
***CK2AWR**	**A**	**778,619**	**800**	**349**
			(Op: VE2AWR)	
*VE3CR	*	550,620	607	345
*VA3TEE	*	375,592	502	266
*VE3OM	*	281,589	377	253
*VE3GSI	*	279,496	401	248
*CK3WO	*	274,340	372	220
*VE7ASK	*	252,894	399	226
*VE3AGC	*	187,704	326	198
*VA3ATT	*	169,538	303	206
***VO1TA**	**A**	**167,972**	**286**	**196**
*VE7YU	*	150,150	301	175
***VE4YU**	**A**	**107,334**	**237**	**178**
*VA3UA	A	70,200	199	150
*VE7BZR	A	39,501	148	99
*VA3HUN	A	33,541	127	99
*VE2FFE	A	32,085	121	93
*VE2OWL	A	3,780	35	35
***VE3XD**	**21**	**101,195**	**229**	**185**
*VE3RCN	*	42,189	154	123
***VE1OP**	**14**	**1,459,872**	**1073**	**548**
***VE3TDG**	**14**	**276,896**	**433**	**272**
*VE3BUC	*	112,093	233	197
*VE3UKR	*	86,154	212	173
***VE2HLS**	**14**	**27,700**	**120**	**100**
***VE3OSZ**	**3.5**	**74,936**	**157**	**116**
*VE3XAX	*	8,736	52	42

MEXICO

XE1MM	**A**	**1,434,648**	**1160**	**452**
XE1V	*	404,047	491	293
***XE2AUB**	**A**	**1,440**	**25**	**24**
***XE2AC**	**7**	**61,348**	**147**	**98**

NICARAGUA

***H7A**	**A**	**963,567**	**886**	**382**
			(Op: YN4SU)	

AFRICA

NIGERIA

***5NØW**	**28**	**184,851**	**303**	**207**
			(Op: OK1DXE)	

MOZAMBIQUE

***C8A**	**A**	**2,885,236**	**1395**	**596**
			(Op: ZS6MG)	

MOROCCO

***CN8YR**	**A**	**58,032**	**156**	**124**

MADEIRA IS.

CT9A	**A**	**11,257,028**	**3624**	**851**
			(Op: OH6RX)	
CT3KN	**A**	**5,452,378**	**2021**	**701**
***CT3EE**	**A**	**9,401,532**	**3304**	**826**
			(Op: DF4SA)	
*CT3BD	*	129,584	232	178
***CT3KU**	**7**	**42,840**	**88**	**84**

CAPE VERDE

D4B	**A**	**15,185,170**	**4681**	**962**
			(Op: 4L5A)	
*D44AC	21	1	1	1

CANARY IS.

EA8BH	**A**	**13,149,465**	**4039**	**915**
			(Op: OH2PM)	
***EA8NQ**	**14**	**471,675**	**481**	**331**
*EA8AVK	*	179,920	289	208

EGYPT

***SU9NC**	**A**	**3,578,872**	**1676**	**607**
***SU9US**	**A**	**1,338,920**	**1019**	**440**

SOUTH AFRICA

***ZS6EGB**	**A**	**14,673**	**73**	**67**
*ZS1JY	*	765	17	17

ASIA

AZERBAIJAN

***4K9W**	**A**	**579,360**	**484**	**340**

GEORGIA

4L8A	**14**	**3,771,138**	**1994**	**707**

ISRAEL

4X3A	**1.8**	**239,135**	**249**	**169**
			(Op: 4X4NJ)	
***4Z5MU**	**A**	**308,840**	**406**	**280**
***4X4ARC**	**A**	**261,485**	**350**	**241**
*4X6UU	*	126,368	219	176
***4XØX**	**7**	**1,614,714**	**789**	**382**
			(Op: 4Z5AX)	

CYPRUS

5B4AHA	**14**	**1,570,725**	**1099**	**537**

KUWAIT

9K9X	**7**	**3,534,382**	**1190**	**542**
			(Op: 9K2RR)	

WEST MALAYSIA

***9M2TO**	**A**	**1,341,894**	**1149**	**474**

SINGAPORE

9V1YC	**14**	**1,940,028**	**1320**	**601**
***9V/G4VGO/MM**	**7**	**7,474**	**37**	**37**

OMAN

***A45WD**	**14**	**1,525,150**	**1110**	**517**
			(Op: YO9HP)	

UNITED ARAB EMIRATES

A61AR	**7**	**2,987,817**	**1110**	**511**
			(Op: RV6LNA)	

TAIWAN

***BW4/UA3VCS**	**21**	**554,561**	**703**	**349**
*BV3BW	*	205,232	456	254

KYRGYZSTAN

EX2X	**14**	**411,466**	**554**	**317**

SOUTH KOREA

HL5UAG	**A**	**383,470**	**538**	**310**
DS5KJR	*	92,201	369	137
***HL2FDW**	**A**	**678,050**	**865**	**355**
***HL1/WX8C**	**A**	**360,815**	**517**	**305**
*DS1CCU	*	260,610	588	238
*HL5A	*	72,962	208	191

THAILAND

E21CJN	**21**	**472,048**	**736**	**362**
HS0ZDZ	**21**	**355,266**	**523**	**306**
***HSØ/OZ1HET**	**A**	**193,732**	**398**	**238**
***E21EIC**	**21**	**110,286**	**237**	**198**
***HS5AYO**	**7**	**768**	**12**	**12**

JAPAN

JH4UYB	**A**	**4,697,312**	**2137**	**724**
JE1JKL	**A**	**3,763,296**	**1753**	**657**
JA6GCE	**A**	**3,558,168**	**1876**	**648**
JA7DLE	*	2,227,407	1335	597
JA1JKG	*	1,722,408	1100	516
JA1BNW	*	649,957	620	367
JA1HP	*	397,200	494	331
JA1QOW	*	319,056	414	289
JR3NZC	*	292,680	380	271
7M4GTU	*	96,714	216	162
JA2QVP	*	47,960	134	110
JA2BQX	*	35,520	140	120
JA1BPN	*	27,368	102	88
JQ2EHD	*	21,060	85	81
JR3XEX	*	14,213	70	61
JE2HCJ	*	6,958	54	49
JA2FSM	*	2,784	35	32
7J1ABD	*	1,980	30	30
JF2FIU	*	1,080	20	20
JA7NVF	**21**	**495,908**	**557**	**356**
JH4UTP	**21**	**368,820**	**490**	**270**
JQ2IQW	*	358,028	453	316
JA5APU	*	264,039	381	283
JH7XGN	**14**	**730,184**	**668**	**413**
JA9CWJ	**14**	**439,005**	**481**	**339**
JJ6WYS	*	25,650	112	95
JA5AP	*	10,120	48	44
JH1AEP	**7**	**1,061,530**	**596**	**370**
JR3WXA	*	52,537	121	107
JG3WCZ	*	6	1	1
***7M1MCT**	**A**	**1,391,280**	**956**	**496**
***JI1RXQ**	**A**	**1,094,703**	**869**	**447**
***JH2NWP**	**A**	**1,037,357**	**788**	**439**
*JA2KVB	*	538,752	606	366
*JH7XMO	*	505,560	514	330
*JF2QNM	*	482,480	581	326
*JA5ATN	*	384,480	435	270
*JA2CXF	*	306,720	401	270
*JA1XUY	*	264,110	376	245
*JA1CP	*	243,775	366	245
*JA6SRB	*	230,265	327	215
*JG3LGD	*	225,000	304	225
*JA1XRH	*	204,960	318	210
*JM4WUZ	*	192,262	273	217
*JS6GIM	*	183,189	296	227
*JA2VZL	*	163,548	260	198
*JF1HPC	*	147,459	288	199
*JA6AKW	*	135,546	245	174
*JA2CUS	*	121,720	264	179
*JH1FNU	*	119,566	250	191
*JA1EMQ	*	110,754	234	189
*JJ6TWQ	*	110,201	216	173
*JA4AQR	*	103,713	213	181
*JR5EHB	*	73,950	205	145
*JHØIXE	*	66,882	181	142
*JK2VOC	*	64,116	197	137
*JA1IZ	*	59,520	149	128
*JA1HG	*	55,912	155	116
*JJ4PPK	*	40,392	131	99
*JE1TSD	*	34,496	116	98
*JG1VGX	*	33,245	135	109
*JA2KCY	*	24,444	116	84
*JR1UMO	*	24,346	98	94
*JR3NDM	*	23,941	102	89
*JA3DAY	*	23,751	99	91
*JAØXZD	*	22,770	97	90
*JA1IE	*	20,904	94	78
*JF2UED	*	20,700	91	75
*JH1BCS	*	16,080	70	60
*JH7QNG	*	11,224	68	61
*JF2BDK	*	8,284	45	38
*JI3KHN/2	*	7,452	50	46
*JA1CPZ	*	5,922	51	42
*JN7OJA	*	5,658	45	41
*JE1SCJ	*	5,313	34	33
*JA7JHT	*	3,844	31	31
*JE1COB	*	3,600	46	40
*JN7NSV	*	2,829	41	23
*JQ2RMA	*	2,754	39	34
*JF7DXT	*	1,748	47	19
*JA1SJR	*	976	18	16
*JG1FGL	*	731	17	17
*JF1ABZ/1	*	112	7	7
***JF3BFS**	**28**	**30,624**	**138**	**116**
*JA4ETH	*	4,836	55	52
*JA1AAT	*	1,375	25	25
*7K2PB8	*	882	22	21
*JH1NXU	*	126	8	7
***JR4GPA**	**21**	**176,295**	**309**	**219**
***JI1ALP**	**21**	**167,825**	**299**	**245**
*JA1OZK	*	111,414	245	186
*JE1RRK	*	15,200	82	80
*JA3HC	*	14,250	80	75
*JGØEXP	*	9,792	67	64
*JF7GDF	*	6,875	57	55
*JA1XPU	*	5,782	50	49
*JA1BUI	*	4,796	45	44
*JA1GYO	*	496	17	16
*JQ1AHZ	*	48	6	6
*JO3LDN	*	12	2	2
***JO3JYE**	**14**	**485,995**	**531**	**355**
***JHØEPI**	**14**	**411,968**	**489**	**314**
***JI3BFC**	**14**	**228,760**	**348**	**266**
*JH1AZO	*	215,864	366	242
*JHØNVX/1	*	141,159	267	223
*JO1QZI	*	105,276	216	186
*JH2OMM	*	64500	164	150
*JJ4CDW	*	40,713	139	128
*JF1XUM/2	*	33,390	118	105
			(Op: JA2KKA)	
*JA3TVQ	*	24,200	112	100
*JH6WBN/1	*	21,054	92	87
*JK1AJX/7	*	16,906	82	79
*JA3LKE	*	10,980	66	61
*JR2AWS/1	*	3	1	1
***JA6WFM**	**7**	**290,952**	**312**	**216**
***JHØNEC**	**7**	**78,408**	**155**	**121**
*JM2RUV	*	72,546	126	113
*JL6IPK	*	50,592	135	102
***JA1IZZ**	**3.5**	**168**	**6**	**6**
***JE1SPY**	**1.8**	**49**	**7**	**7**

MONGOLIA

JT1CO	**A**	**1,477,968**	**1200**	**492**

BANGLADESH

***S21YY**	**A**	**234,000**	**477**	**240**

ASIATIC TURKEY

TA3/G3AB	**7**	**4,266,512**	**1347**	**571**
***TA3DD**	**A**	**4,032,103**	**2070**	**567**

ASIATIC RUSSIA

UA9CDV	**A**	**5,484,283**	**2248**	**679**
RW9UP/9	**A**	**4,285,665**	**2010**	**655**
RZ9HG	**A**	**4,090,044**	**1812**	**667**
RA9SG	*	2,932,772	1469	578
RZ9AE	*	1,463,238	915	474
RL9FYL	*	459,584	492	334
			(Op: UA9FM)	
RV9XO	*	250,743	334	249
RV9XJ	*	7,844	53	53
RZ9IR	*	893	19	19
UA9QFF	**21**	**405,072**	**506**	**291**
UA9XS	**14**	**292,320**	**374**	**290**
RX9LW	*	103,351	219	181
***UA9OA**	**A**	**1,178,940**	**755**	**420**
***RK9CR**	**A**	**750,324**	**615**	**372**
***RA9XF**	**A**	**703,755**	**647**	**351**
*RX9AM	*	618,585	511	345
*UA9HN	*	265,620	359	228
*UA9DD	*	219,558	291	222
*RA9XU	*	209,500	318	250
*UA9OSV	*	196,878	326	209
*UA9CR	*	100,701	204	167
*RX9WN	*	68,175	156	135
*RV9CLF	*	48,552	136	119
***UA9AFS**	**21**	**285,120**	**394**	**297**
***RW9MD**	**21**	**232,218**	**337**	**266**
*UA9LCY	*	184,440	335	232
*UA9JRL	*	22,428	101	84
*UA9OAL	*	11,109	75	69
***RA9JR**	**14**	**645,084**	**619**	**396**
***UA9FGJ**	**14**	**613,756**	**564**	**407**
*UA9CCL	*	537,375	535	375
*RA9AC	*	533,197	553	361
*RA9KM	*	101,325	215	175
*UA9MQR	*	1,188	22	22
***UA9YAB**	**7**	**192,420**	**234**	**180**
RMØA	**"**	**4,220,775**	**1948**	**675**
			(Op: UAØANW)	
UAØAZ	**"**	**866,656**	**630**	**424**
RSØF	*	299,484	502	282
UAØSMF	*	30,135	163	105
RTØQ	**14**	**1,865,756**	**1229**	**604**
***RAØJX**	**A**	**354,780**	**492**	**292**
*RAØAM	*	69,412	171	148
*UAØLS	*	19,906	82	74
*UAØIV	*	9,724	97	68
*UAØLEL	*	8,256	53	48
*RWØLZ	28	27	3	3
***RWØAR**	**21**	**1,170**	**27**	**26**
***RUØAT**	**14**	**3,978**	**40**	**39**
*RUØAE	*	2,175	29	29
***UAØSC**	**7**	**100,962**	**201**	**142**

UZBEKISTAN

***UK/JI2MED**	**A**	**355,306**	**444**	**287**

KAZAKHSTAN

UN4L	**A**	**5,370,270**	**2299**	**690**
UN5J	**A**	**612,909**	**651**	**369**
UP1G	*	213,118	345	226
UN7LZ	**28**	**98,778**	**244**	**163**
UN6GN	**21**	**1,778,340**	**1270**	**554**
UP5G	**14**	**2,234,424**	**1430**	**628**
***UP6P**	**A**	**1,284,864**	**969**	**448**
***UN8FM**	**21**	**3,104**	**35**	**32**
***UN6LN**	**14**	**313,496**	**398**	**298**
*UN7JX	*	258,640	374	265
*UN4PD	*	124,200	232	207
***UN4PG**	**7**	**89,281**	**138**	**127**

HONG KONG

VR2BG	**A**	**125,860**	**277**	**203**

INDIA

***VU2UR**	**A**	**28,016**	**110**	**103**

IRAQ

*YI/S57CQ	A	18	2	2

UK BASES ON CYPRUS

***ZC4VG**	**A**	**233,298**	**341**	**234**

EUROPE

CROATIA

9A9D	**A**	**3,053,045**	**1989**	**685**
			(Op: HA3LN)	
9A5Y	**28**	**477,835**	**763**	**421**
9A9A	**14**	**3,729,528**	**2078**	**831**
9A4X	**14**	**2,808,502**	**1804**	**731**
9A3MA	**7**	**59,458**	**192**	**137**
9A7V	**3.5**	**773,721**	**753**	**389**
9A5E	**3.5**	**750,420**	**744**	**379**
9A7DM	*	352,291	545	289
***9A4RC**	**A**	**1,598,844**	**1394**	**554**
***9A2W**	**14**	**735,707**	**823**	**463**
			(Op: 9A4KW)	
***9A4MF**	**7**	**66,172**	**210**	**142**
***9A4WW**	**3.5**	**105,432**	**269**	**184**

MALTA

9H1ZA	**21**	**2,898,720**	**2075**	**792**

PORTUGAL

***CT1ILT**	**A**	**3,697,200**	**2217**	**720**
***CT1AOZ**	**A**	**393,056**	**530**	**346**
***CT1FNT**	**21**	**32,385**	**143**	**127**
***CT1BNW**	**14**	**26,412**	**143**	**124**

GERMANY

DL3YBM	**A**	**1,889,925**	**1539**	**565**
DL1DTC	**A**	**1,095,866**	**1057**	**502**
DL8QS	**A**	**986,248**	**963**	**488**
DL7VDX	*	861,512	852	452
DH1NFL	*	792,610	873	455
DL4HRM	*	706,959	805	407
DL3FF	*	641,826	787	394
DL8UKE	*	74,654	196	163
DL5CD	*	62,720	226	160
DJ7LH	*	29,580	114	102
DJ3WE	*	27,930	114	98
DL1ET	*	22,946	102	77
DH1TW	*	21,004	108	89
DL3TD	**21**	**1,843,670**	**1357**	**662**
DJ2MX	**21**	**878,696**	**856**	**497**
DK2GZ	*	707,135	735	473
DLØCS	*	527,200	684	400
DL4MCF	**14**	**2,403,000**	**1613**	**712**
DK2OY	**14**	**1,430,316**	**1282**	**593**
DJ6QT	**7**	**498,212**	**510**	**338**
DK3KD	**3.5**	**192,510**	**362**	**230**
DL7CX	**1.8**	**46,125**	**186**	**125**
***DJ2QV**	**A**	**1,887,427**	**1470**	**613**
***DL7BY**	**A**	**1,418,376**	**1196**	**523**
***DL4FN**	**A**	**1,115,300**	**1102**	**475**
*DF9DM	*	736,064	844	434
*DL4JYT	*	601,380	783	390
*DL9ABM	*	384,744	551	328
*DJ8UV/P	*	382,950	546	345
*DL3ZAI	*	282,338	465	301
*DJ3JD	*	270,592	494	302
*DL5KUA	*	170,556	352	233
*DL6UAM	*	160,905	356	255
*DL8CX	*	149,460	345	235
*DL2GBB	*	148,897	320	239
*DL2ANM	*	132,908	312	223
*DL1SBF	*	100,744	260	196
*DJ2IA	*	92,950	223	169
*DL8DXL	*	88,780	283	193
*DL8DWW	*	78,772	228	188
*DL1EEX	*	78,676	234	178
*DL3BZZ	*	74,947	200	149
*DL2AL	*	74,163	239	177
*DL6RBH	*	63,855	210	165
*DJ9AO	*	62,720	200	160
*DF1HF	*	57,512	203	158
*DK5ZX	*	54,901	200	161
*DL5MO	*	32,508	125	108
*DF6WE	*	30,734	156	121
*DL2RTJ	*	17,286	107	86
*DL2AXM	*	9,424	102	76
*DJ4KW	*	6,678	78	63
*DF5AU	*	6,250	62	50
*DL2KWW	*	2,822	37	34
***DL4KUG**	**28**	**3,600**	**50**	**45**
*DJ2YE	*	2,065	37	35
***DL3BRA**	**21**	**95,095**	**249**	**209**
***DL5RMH**	**14**	**69,005**	**233**	**185**
*DL1FMG	*	33,176	163	143
*DK9BW	*	20,679	121	113
***DL5YL**	**7**	**318,478**	**481**	**289**
***DJ5GG**	**7**	**280,815**	**413**	**291**
*DL2SDQ	*	63,624	141	132
*DL6UAA	*	33,180	133	105
*DL7UIO	*	6,812	69	52

SPAIN

EA1DX	**A**	**3,879,704**	**2318**	**796**
			(Op: EA5FV)	
EA4NP	**A**	**2,127,237**	**1562**	**609**
AN1FD	**A**	**1,281,354**	**1105**	**498**
EA3KU	*	712,310	881	437
EA1JO	*	490,464	668	393
AN2AOI	*	305,688	441	282
AM1AEH	*	40,365	175	135
EA/LW9DA	**7**	**1,479,177**	**946**	**477**
***AM7RM**	**A**	**2,739,910**	**2048**	**622**
***AM4DRV**	**A**	**1,389,750**	**1389**	**545**
***EA4BWR**	**A**	**319,056**	**482**	**289**
*AM7AJR	*	296,703	568	297
*EA7CA	*	164,250	326	225
*EA3AXM	*	115,500	288	210
*EA7CWA	*	112,881	257	197
*EA1WX	*	97,092	240	174
*EC3AJL	*	70,336	197	157
*EF2API	*	60,350	197	142
*EA3AVV	*	32,034	139	114
*EA7MT	*	18,240	99	96
*EA4BNQ	*	9,300	83	75
*EA1DGG	*	2,992	34	34
*EA7GV	*	680	22	20
***AN7WA**	**21**	**550,352**	**722**	**424**
***EA5DCL**	**21**	**249,422**	**394**	**311**
*AN7KJ	*	134,865	329	243
*EA7FZ	*	13,430	94	85
*EA4UB	*	2,520	30	30
***EA7TG**	**14**	**575,424**	**752**	**444**

BALEARIC IS.

***EA6/DL8YR**	**A**	**391,956**	**583**	**367**

IRELAND

EI4DW	**A**	**478,828**	**631**	**349**
***EI9ES**	**A**	**15,604**	**112**	**94**
***EI4CF**	**21**	**92,040**	**216**	**195**
***EI6DX**	**14**	**25,102**	**150**	**188**

MOLDOVA

***ER1OO**	**1.8**	**22,568**	**110**	**91**

ESTONIA

ES2DJ	**A**	**1,073,835**	**1060**	**487**
ES5TV	**7**	**1,619,160**	**1058**	**515**
ES4RD	**3.5**	**242,277**	**436**	**249**
***ES5RY**	**A**	**1,346,982**	**1239**	**546**
*ES7FU	*	19,306	127	98
***ES5RAH**	**7**	**50,173**	**164**	**131**
***ES1TM**	**3.5**	**87,880**	**251**	**169**

BELARUS

EW1CQ	**A**	**689,724**	**813**	**441**
EU1SA	**28**	**46,190**	**260**	**149**
EU1DX	**14**	**872,850**	**921**	**506**
EW3LN	**7**	**265,938**	**314**	**254**
EU1CJ	**3.5**	**171,039**	**366**	**213**
***EU1MM**	**A**	**204,565**	**384**	**251**
***EV6Z**	**A**	**178,064**	**393**	**248**
*EW1NZ	*	33,885	176	135
*EW1NA	*	29,636	139	124
*EU1CC	*	18,849	115	103
*EU4LY	*	7,503	69	61
***EU2MM**	**14**	**661,978**	**754**	**479**
***EU6DX**	**3.5**	**225,828**	**396**	**246**

FRANCE

F5VHY	**A**	**2,007,269**	**1428**	**583**
			(Op: G3MXJ)	
F5CQ	**A**	**430,920**	**554**	**342**
F5OIH	*	401,030	514	337
F6HWU	*	349,344	483	288
F5YJ	*	300,390	488	285
F5BBD	*	175,794	400	249
F6GQO	*	137,112	327	232
F5NCU	*	31,842	151	122
TM9R	**21**	**1,859,834**	**1369**	**646**
			(Op: F6IRA)	
TM7XX	**14**	**2,787,056**	**1854**	**746**
			(Op: F5MUX)	
F5NBX	**7**	**1,947,778**	**1127**	**526**
***F8AKC**	**A**	**647,218**	**738**	**403**
***F5UKL**	**A**	**629,119**	**682**	**391**
***F6AUS**	**A**	**566,912**	**684**	**412**
*TM7A	*	438,327	712	339
			(Op: F8BBL)	
*F5TNI	*	368,856	523	327
*F3GJ	*	309,519	445	289
			(Op: F5NQL)	
*F5RAB	*	171,196	408	254
*F5JOT	*	168,200	336	232
*F5SGI	*	163,438	325	253
*F6ABI	*	83,569	236	193
***F8PDR**	**3.5**	**19,749**	**90**	**87**

ENGLAND

G5W	**A**	**3,364,558**	**2279**	**703**
			(Op: G3BJ)	
G3XTT	**A**	**2,812,160**	**1816**	**640**
G3TXF	**A**	**2,146,196**	**1622**	**596**
M7W	*	95,452	297	196
			(Op: G4IIY)	
GX5RP	**7**	**1,128,423**	**864**	**453**
			(Op: G3SEK)	
***GØMTN**	**"**	**1,424,294**	**1501**	**514**
***G3ZRJ**	**"**	**783,288**	**874**	**414**
***M/AD8J**	**"**	**475,354**	**712**	**374**
*G3OOU	A	427,378	672	343
*GØUKX	A	374,712	513	312
*M8C	A	339,301	483	311
			(Op: G4DBL)	
*G4KFT	A	322,240	441	304
*G3YEC	A	297,822	480	294
*G3MPB	A	76,437	191	149
*G4GOY	A	72,975	239	175
*GØMRH	*	44,671	189	131
***M4K**	**14**	**1,769,362**	**1643**	**658**
			(Op: MØBEW)	
*MXØEEE/P	*	58,056	264	177
			(Op: GØVQR)	
*M3GUA	*	1,344	77	16
***G4FAL**	**21**	**31,850**	**145**	**130**
***G3RSD**	**7**	**197,736**	**325**	**231**

NORTHERN IRELAND

***GI4KSH**	**14**	**47,571**	**177**	**157**

JERSEY

GJ2A	**A**	**1,146,600**	**1124**	**504**
			(Op: K2WR)	

SCOTLAND

GM4SID	**A**	**1,114,316**	**1170**	**476**
GS2MP	**14**	**3,300,678**	**2220**	**787**
			(Op: GM4FAM)	
MMØDFV/P	**14**	**1,608,036**	**1548**	**618**
***GM3CFS**	**21**	**151,892**	**325**	**254**

GUERNSEY

***MUØFAL**	**A**	**432,371**	**611**	**337**

WALES

GW7X	**7**	**2,119,078**	**1239**	**547**
			(Op: GW3NJW)	
***GW3KJN**	**14**	**122,766**	**293**	**222**

HUNGARY

HG8R	**A**	**3,516,862**	**2098**	**722**
HA3LI	**A**	**2,370,690**	**1654**	**639**
HG8W	*	25,359	147	107
			(Op: HA8ZO)	
HA1ZZ	**14**	**1,914,009**	**1511**	**669**
HG9X	**7**	**2,316,480**	**1226**	**570**
			(Op: HA9PP)	
***HG8I**	**A**	**2,560,744**	**1894**	**646**
***HA6IAM**	**A**	**869,346**	**962**	**459**
*HG9M	*	145,464	351	228
*HA5PT	*	7,685	59	53
***HA3JB**	**21**	**304,608**	**496**	**334**
*HA8FW	*	246,015	409	315
***HG4F**	**14**	**1,246,416**	**1120**	**552**
***HA8FK**	**14**	**915,975**	**981**	**531**
***HA4FV**	**7**	**401,190**	**488**	**311**
*HA8GY	*	275,236	346	268
***HA8LLS**	**3.5**	**322,025**	**533**	**275**

SWITZERLAND

***HB9ARF**	**A**	**1,170,654**	**1154**	**499**
*HB9HQX	*	172,890	323	226

ITALY

IR6W	**A**	**1,489,904**	**1279**	**551**
			(Op: IK6SNQ)	
IK2UCK	**A**	**1,365,728**	**1270**	**536**
IK2AOO	*	254,569	425	287
IV3IYH	**21**	**1,438,618**	**1188**	**593**
IKØYVV	**14**	**2,229,390**	**1581**	**690**
IK2AHB	*	130,662	345	238
IU3X	**7**	**2,103,920**	**1152**	**560**
IK1QBT	**3.5**	**359,268**	**515**	**294**
***IR2Y**	**A**	**2,417,500**	**1714**	**625**
***I6FDJ**	**A**	**478,686**	**774**	**361**
***IK4DCS**	**A**	**446,752**	**652**	**368**
*IK2NUX	*	274,781	435	299
*IN3FHE	*	153,008	341	262
*II2B	*	142,064	276	208
*IØJFE	*	86,184	210	171
*IK2NCF	*	36,708	152	133
*IK2WYI	*	32,490	126	95
*IV3KSE	*	16,036	89	76
*IK4ALM	*	9,044	75	68
*IØYQV	*	7,367	57	53
***IR4R**	**28**	**4,004**	**47**	**44**
***IZ4DYX**	**14**	**32,604**	**149**	**132**
*IZ2EID	*	12,070	94	85
*IK5OJB	*	1,305	31	29
***I2IFT**	**7**	**800,316**	**762**	**396**
*IR2V	*	537,716	550	358
			(Op: I2WIJ)	

SARDINIA

ISØUWX	**14**	**15,134**	**99**	**94**
***ISØOMH**	**A**	**492,785**	**618**	**335**
***ISØHQJ**	**A**	**491,596**	**623**	**362**
*ISØRDY	*	170,376	311	248
***ISØSDX**	**14**	**322,784**	**597**	**352**

SICILY

***IT9ORA**	**A**	**548,340**	**687**	**380**

NORWAY

LA7MFA	**A**	**1,353,240**	**1330**	**504**
***LA3BO**	**A**	**1,381,072**	**1407**	**532**
*LA6FJA	*	657,189	722	411
***LA1YE**	**14**	**287,928**	**603**	**344**
***LA1QDA**	**7**	**19,092**	**97**	**86**

LUXEMBOURG

***LX1JH**	**A**	**81,705**	**273**	**195**

LITHUANIA

LY2MM	**A**	**1,212,638**	**1111**	**518**
LY2OX	**A**	**1,199,520**	**1083**	**510**
LY1BX	*	561,922	705	382
LY2CY	*	185,496	314	236
LY2KM	*	135,520	336	242
LY6M	*	49,445	201	145
			(Op: LY1DS)	
LY2IJ	**14**	**2,599,974**	**1781**	**738**
LY9A	**14**	**2,175,630**	**1670**	**705**
			(Op: LY3BA)	
LY2LF	*	135,850	372	247
LY2MW	**7**	**1,942,080**	**1151**	**544**
LY2OU	*	342,200	439	245
LY2BW	**3.5**	**482,760**	**620**	**324**
LY1CT	**3.5**	**403,416**	**568**	**312**
LY2TE	*	332,630	529	290
LY3BS	*	2,888	41	38
***LY7Z**	**A**	**3,693,162**	**2306**	**726**
			(Op: LY2TA)	
***LY2KW**	**A**	**1,239,510**	**1205**	**523**
*LY2XW	*	893,748	1139	426
*LY3BX	*	478,315	577	353
*LY3CY	*	47,112	177	151
***LY5A**	**7**	**1,191,224**	**906**	**461**
			(Op: LY2PAJ)	
***LY6A**	**7**	**1,139,544**	**914**	**456**
			(Op: LY2BM)	
*LY2BBF	*	27,538	117	98
***LY3CW**	**3.5**	**225,400**	**418**	**245**
***LY2GW**	**1.8**	**45,125**	**174**	**125**

BULGARIA

LZ1BJ	**A**	**1,337,996**	**1104**	**517**
LZ5ZI	*	152,514	310	222
LZ3UA	**14**	**951,748**	**977**	**532**
LZ2PL	*	373,105	593	355
***LZ3YY**	**A**	**1,951,056**	**1682**	**612**
*LZ3FN	*	421,344	626

AUSTRIA

OE5CWL	**7**	**1,482,329**	**1095**	**491**
***OE5T**	**14**	**38,860**	**188**	**145**
			(Op: OE5OHO)	

FINLAND

OH5DX	**A**	**1,766,240**	**1561**	**581**
OH7M	**A**	**1,317,580**	**1232**	**565**
			(Op: OH4XX)	
OH4RH	*	678,300	957	425
OH5NE	*	602,504	805	392
OH2VZ	*	164,750	351	250
OH4A	**14**	**2,700,138**	**1847**	**742**
			(Op: OH6QU)	
OH8L	**14**	**1,342,116**	**1296**	**578**
			(Op: OH8LQ)	
OH3XR	**1.8**	**125,450**	**307**	**193**
OH9W	**3.5**	**354,780**	**530**	**292**
			(Op: OH2BCI)	
***OI4PM**	**A**	**1,865,760**	**1784**	**598**
			(Op: OH4JFN)	
***OH6OS**	**A**	**1,046,342**	**1256**	**478**
*OH2FS	*	370,946	418	386
*OH5YU	*	191,970	427	270
*OH2LO	*	6,435	57	55
***OH6RC**	**14**	**111,438**	**299**	**246**
***OH8VJ**	**3.5**	**48,312**	**169**	**132**

CZECH REPBULIC

OK2ZC	**A**	**1,440,094**	**1281**	**542**
OK2PDT	**A**	**1,155,080**	**1101**	**536**
OL7D	**A**	**1,125,496**	**1128**	**523**
			(Op: OK1FHI)	
OK2ABU	*	748,034	799	449
OK1DOS	*	699,174	829	434
OK1OX	*	355,875	530	325
OK1DVK	*	279,720	370	360
OK1AUC	**28**	**68,020**	**244**	**190**
OK1KZE	**21**	**913,275**	**911**	**495**
			(Op: OK1FPS)	
OK2SG	*	45,750	159	150
OK1RF	**14**	**3,685,770**	**2074**	**803**
OK1CF	**7**	**2,577,459**	**1307**	**577**
OK1DSZ	**7**	**1,495,697**	**936**	**511**
OL4M	**3.5**	**357,898**	**560**	**298**
***OK2PP**	**A**	**2,610,861**	**1872**	**671**
***OK2ZV**	**A**	**1,968,167**	**1574**	**593**
***OL6Z**	**A**	**1,576,260**	**1337**	**556**
			(Op: OK2DU)	
*OK2BYW	*	1,443,388	1100	541
*OK1HX	*	1,398,123	1263	531
*OK2LW	*	1,367,046	1171	519
*OK2MBP	*	1,099,644	1148	494
*OK2QX	*	999,110	1024	490
*OK1BA	*	989,412	953	492
*OK1ZP	*	828,307	857	463
*OK2SGY	*	766,080	756	456
*OK1FCA	*	761,362	793	457
*OK1AYY	*	716,634	788	414
*OK1FKV	*	569,972	756	388
*OL2W	*	559,874	656	394
			(Op: OK1DXD)	
*OK1DKO	*	525,798	647	378
*OK2KJ	*	463,936	621	352
*OK1DUG	*	385,947	652	333
*OK1KZ	*	353,600	541	320
*OK2BMT	*	333,270	450	315
*OK2TCW	*	333,213	521	327
*OK2BNX	*	327,988	494	334
*OK2PHC	*	310,496	521	313
*OK2BJ	*	266,364	402	302
*OK2BDF	*	253,134	429	294
*OK1FRO	*	178,890	395	267
*OK2BNC	*	164,727	397	259
*OK2BND	*	159,174	310	239
*OK2SWD	*	140,864	333	248
*OK2PBG	*	77,520	228	170
*OK2BGK	*	34,606	140	121
*OK2BQL	*	22,672	127	104
*OK1SI	*	12,331	60	59
*OK1MMN	*	94,326	242	199
***OK1WMV**	**14**	**816,714**	**836**	**471**
***OK2WH**	**14**	**519,021**	**709**	**423**
*OK2HZ	*	476,010	595	430
*OK1MKI	*	287,496	481	263
*OK2BEM	*	169,056	333	288
*OK1GS	*	158,424	322	276
*OK1ARO	*	21,809	123	113
***OL7S**	**7**	**759,782**	**743**	**398**
			(Op: OK2BU)	
***OK1DPB**	**7**	**369,660**	**469**	**305**
*OK1IBP	*	238,682	361	262
*OK1PLF	*	23,845	109	95
*OK2PXD	*	18,700	95	85
***OK1XUV**	**3.5**	**303,199**	**484**	**281**
*OK5SWL	*	4,429	50	43
			Op: OK2SWD)	
***OL8A**	**1.8**	**20,010**	**114**	**87**
			(Op: OK1CZ)	

SLOVAKIA

OM3OM	**A**	**1,409,256**	**1280**	**529**
OM4JD	*	135,473	293	221
OM3NA	**14**	**2,332,393**	**1571**	**707**
***OM6RM**	**A**	**1,089,726**	**1173**	**474**
***OM4DN**	**A**	**1,004,390**	**1055**	**470**
***OM8ON**	**A**	**926,404**	**816**	**482**
*OM7AG	*	473,484	657	374
*OM4TX	*	357,000	509	340
*OM7VF	*	307,952	480	304
*OM3PQ	*	275,280	483	310
*OM1AF	*	262,968	431	278
*OM3RDM	*	253,708	453	287
			(Op: OM4TQ)	
*OM7AT	*	164,703	386	253
*OM4DA	*	113,776	303	208
*OM3GB	*	112,140	213	178
*OM3BA	*	95,211	269	213
*OM6TX	*	5,368	66	61
***OM7YC**	**21**	**140,360**	**286**	**242**
*OM4K	*	49,478	158	143
			(Op: OM4AA)	
*OM8AQ	*	36,966	139	122
***OM2AK**	**14**	**284,136**	**414**	**316**
***OM4WW**	**7**	**472,806**	**496**	**321**
*OM3CDN	*	132,458	270	206
***OM6TY**	**3.5**	**38,517**	**161**	**111**

BELGIUM

***ON4KLG**	**A**	**786,396**	**946**	**426**
***ON4XG**	**A**	**404,255**	**608**	**347**
***ON4ADZ**	**21**	**181,440**	**350**	**270**
***ON4KVA**	**A**	**13,244**	**95**	**86**
***ON5ZO**	**7**	**75,543**	**214**	**149**
***ON6TJ**	**1.8**	**4,400**	**51**	**44**

FAROE IS.

***OY3ON**	**A**	**68,237**	**227**	**181**

DENMARK

OZ1JTE	**A**	**199,746**	**418**	**274**
OZ4O	**28**	**2,142**	**49**	**42**
***OZ1BMA**	**A**	**303,264**	**590**	**324**
***OZ4FF**	**A**	**133,630**	**326**	**230**
*OZ5UR	*	127,280	297	215
*OZ0RS	*	47,680	196	149
*OZ0J	*	15,531	101	93
***OZ4RT**	**14**	**200,640**	**330**	**330**

THE NETHERLANDS

PA8AD	**A**	**957,497**	**1073**	**461**
PA0JNH	**A**	**495,060**	**629**	**370**
PA5TT	*	492,362	650	377
PA5WT	*	297,860	542	281
PA3CLQ	*	4,187	62	53
PA0LOU	**21**	**25,812**	**110**	**108**
***PB6W**	**A**	**503,956**	**767**	**361**
			(Op: PA3CWL)	
***PA3AAV**	**A**	**450,340**	**604**	**356**
*PA7RA	*	140,656	363	236
*PA3GBI	*	129,042	302	214
*PA3HGF	*	105,600	262	200
*PA2ALF	*	95,340	272	210
*PA5EA	*	94,276	250	196
*PA0ADP	*	86,925	246	183
*PA3BFH	*	74,340	226	177
*PA0KHS	*	56,724	210	163
*PA3ELD	*	23,124	99	82
*PA0LSK	*	17,544	114	102
***PA0JED**	**21**	**74,555**	**217**	**185**
***PA3FDO**	**14**	**201,188**	**485**	**292**
*PA0RBS	*	34,748	168	146
***PA0MIR**	**3.5**	**107,016**	**257**	**182**

SLOVENIA

S58A	**14**	**3,614,334**	**2013**	**822**
S59ZZ	**14**	**1,781,550**	**1421**	**642**
S50A	**7**	**3,020,544**	**1462**	**621**
S510I	**7**	**2,163,173**	**1207**	**577**
S57DX	**3.5**	**622,278**	**705**	**362**
***S58RU**	**A**	**98,802**	**262**	**198**
***S53ZO**	**A**	**15,124**	**85**	**76**
***S59W**	**21**	**1,010,446**	**933**	**526**
*S51J	*	127,387	307	239
***S57Z**	**14**	**1,681,598**	**1350**	**601**
*S52W	*	717,822	797	486
***S54A**	**7**	**1,102,608**	**855**	**456**
***S53F**	**3.5**	**384,978**	**556**	**307**
*S53P	*	87,780	254	165
			(Op: S51NZ)	

SWEDEN

8S5A	**A**	**3,238,560**	**2239**	**720**
			(Op: SM5AJV)	
SM6E	**A**	**1,251,030**	**1246**	**510**
			(Op: SM6FUD	
SM5Q	*	462,500	680	370
			(Op: SM5AOE)	
SM6IQD	*	55,719	194	151
7S2E	**14**	**2,006,040**	**1762**	**687**
			(Op: SM2DMU)	
SK3GW	**14**	**1,412,909**	**1307**	**587**
			(Op: SM5IMO)	
7S5C	*	22,310	138	115
			(Op: SM5CBM)	
SM6CDG	*	546	22	21
***7S6N**	**A**	**1,909,908**	**1622**	**636**
			(Op: SM6CNN)	
***SM3PZG**	**A**	**1,236,411**	**1329**	**543**
***SM7EH**	**A**	**355,225**	**593**	**325**
*SM7BJW	*	180,848	382	254
*SM6XKB	*	141,360	353	228
*SM6D	*	131,949	346	243
			(Op: SM6DER)	
*SM4F	*	126,672	257	203
			(Op: SM4DHF)	
*SKØX	*	112,792	252	184
			(Op: OH5JTI)	
*SM5BRG	*	69,530	216	170
*8SØW	*	66,518	158	137
			(Op: SMØNJO)	
*SM7BQX	*	66,051	237	179
*SM5RE	*	65,301	241	159
*SM3AVW	*	50,544	227	156
*SM7BVO	*	29,614	149	134
*SMØBOS	*	29,154	130	129
*SM3EAE	*	18,540	101	90
*SM6BZE	*	220	10	10
***8SØF**	**14**	**388,734**	**681**	**402**
			(Op: SMØOGQ)	
*SM7YEA	*	263,504	492	344
*8S6A	**7**	183,736	336	238
			(Op: SM6DPF)	
*SM7VZX	*	46,886	177	119

POLAND

SP5HNK	**A**	**683,700**	**878**	**430**
SP3XR	*	62,458	225	167
SP9W	**28**	**161,980**	**499**	**260**
SP2QG	**21**	**325,026**	**522**	**351**
SN7Q	**14**	**3,997,145**	**2261**	**835**
SP4DEU	**14**	**1,511,952**	**1263**	**624**
SP4D	*	277,450	413	310
SP3FYX	**7**	**509,078**	**601**	**331**
SN8F	**3.5**	**550,278**	**669**	**342**
			(Op: SP8FHK)	
SP5DRH	**1.8**	**95,288**	**264**	**172**
***SP4ZO**	**A**	**1,797,276**	**1605**	**562**
***SP9H**	**A**	**1,492,323**	**1238**	**537**
***3Z2D**	**A**	**961,071**	**1186**	**457**
			(Op: SP2DNI)	
*SP6LV	*	758,880	847	465
*SP2HPD	*	671,972	788	412
*SN5J	*	626,940	716	405
			(Op: SP5JXK)	
*SP6KFA	*	603,906	849	401
			(Op: SP6MLG)	
*SP1AEN	*	522,445	695	385
*SP3DIK	*	447,100	671	340
*SP9FT	*	373,980	590	345
*SP9GKM	*	346,752	565	336
*SP6BEN	*	323,268	480	341
*SQ9MZ	*	297,040	483	316
*3Z8Z	*	252,546	371	294
*3Z3OL	*	249,232	466	296
*SP3V	*	239,292	402	276
*SQ9FMU	*	221,100	395	275
*SP8FHJ	*	189,688	400	262
*SP6CES	*	189,000	355	250
*SP9SOU	*	185,344	369	256
*SP3DOF	*	166,212	330	243
*SP6IEQ	*	103,716	241	201
*SP2JGK	*	97,026	274	206
*SP2DKI	*	41,580	156	126
*SQ9ZM	*	37,520	157	140
*SP6M	*	36,800	144	115
*SP4BOS	*	36,096	173	141
*SP3PKL	*	25,422	134	114
			(Op: SP3XBN)	
*SP6DHH	*	23,865	215	111
*SP3MY	*	18,285	170	53
*SP2JYR	*	14,364	79	76
*SP9MCU	*	8,840	77	68
*SP2FWC	*	7,950	86	75
*SP7BDS	*	5,610	61	55
*SP1EGN	*	2,046	34	33
*SP6BSL	*	297	11	11
***SP3LWP**	**28**	**26,564**	**153**	**127**
***SP5GH**	**28**	**22,632**	**128**	**123**
*SP6IHE	*	21,177	133	117
*SP7FGA	*	4,150	83	50
*SP4JCQ	21	192,384	394	288
***SP3GXH**	**21**	**61,918**	**193**	**166**
*SP2GCE	*	32,851	157	133
***SP8BAB**	**14**	**486,353**	**611**	**427**
*SP8GNF	*	22,624	122	112
***SP5JTF**	**7**	**858,432**	**795**	**408**
***SP4GFG**	**7**	**432,276**	**450**	**326**
*SP9EMI	*	205,257	312	247
*SO1RON	*	100,419	250	179
*SP5CGN	*	33,522	126	111
*SP4AAZ	*	10,034	61	58
***SP2HMT**	**3.5**	**113,856**	**265**	**192**
*SP9OUX	*	68,856	220	151
***SP2GJV**	**1.8**	**103,761**	**274**	**183**
*SQ2DMU	*	105	7	7

GREECE

***SV1BJW**	*	**54,000**	**173**	**144**
*SV1DPI	A	41,400	144	120
***SV1ENG**	**21**	**339,405**	**627**	**363**
***SV1BSX**	**14**	**492,884**	**788**	**406**

DODECANESE

SV5/DL3DRN	**A**	**273,714**	**587**	**294**
***SV5/DJ5AA/P**	**A**	**800,112**	**1042**	**422**
*J45KLN	*	379,440	642	340
			(Op: SMØCMH)	

CRETE

***SV9/DL7VOG/P**	**A**	**987,870**	**1177**	**510**

BOSNIA-HERZEGOVINA

T94NO	**21**	**1,236,480**	**1210**	**560**
T96Q	**14**	**2,927,639**	**1847**	**767**
***T97M**	**A**	**2,412,112**	**1749**	**656**
***T95A**	**A**	**1,852,635**	**1467**	**565**
***T94DJ**	**3.5**	**213,666**	**424**	**239**

ICELAND

***TF3GB**	**A**	**472,004**	**673**	**377**
***TF3MA**	**14**	**12,276**	**98**	**93**

CORSICA

***TK/S52A**	**A**	**2,976,190**	**1860**	**697**
			(Op: S59AA)	

EUROPEAN RUSSIA

RK4FF	**A**	**4,421,680**	**2863**	**760**
RZ3AZ	**A**	**3,668,311**	**2335**	**779**
UA4WA	**A**	**1,987,357**	**1653**	**617**
RN4WA	*	1,981,220	1677	590
RU4LM	*	1,398,768	1129	552
RX3DCX	*	1,173,988	1161	508
RZ3DX	*	722,514	782	471
RK3BA	*	624,000	812	384
UA1OAM	*	485,085	721	365
RN6FA	*	463,680	759	368
UA4SU	*	427,763	583	371
UA3UJE	*	336,483	507	327
RA3SL	*	287,679	487	309
UA3MDX	*	261,122	458	274
RK3AZ	*	200,669	381	263
RL1C	*	166,275	348	225
			(Op: RV1CC)	
RA3DUT	*	119,658	272	222
RU3DX	*	41,602	164	122
UA1AKE	*	23,004	104	71
RA1AR	*	3,630	41	30
RA3XO	*	1,197	21	19
UA4LY	*	901	17	17
RN4LP	*	231	7	7
RN6FO	**21**	**867,845**	**999**	**509**
RT3A	**14**	**2,089,250**	**1626**	**685**
RA3TT	**14**	**1,325,835**	**1287**	**621**
UA1CEC	*	147,364	401	277
RU4CO	**7**	**467,454**	**542**	**338**
RK5BZ	**7**	**434,378**	**528**	**322**
RW6CF	*	328,500	414	292
UA6AKD	**3.5**	**88,725**	**250**	**169**
RX3AEX	**1.8**	**2,736**	**40**	**38**
***UA4FER**	**A**	**2,419,466**	**1833**	**658**
***UA1OMZ**	**A**	**1,562,064**	**1467**	**584**
***UA3MBP**	**A**	**1,333,566**	**1240**	**533**
*RU6FA	*	1,096,800	1119	480
*RK3BX	*	991,128	1043	488
*RA4HW	*	990,370	992	485
*UA4WLI	*	806,042	964	467
*RA3NZ	*	727,308	888	454
*RA4CTR	*	441,045	689	363
*UA3PW	*	391,650	596	350
*RW6BN	*	389,196	630	342
*RV3FF	*	347,384	614	346
*UA3RIC	*	289,358	503	298
*RA6HR	*	280,402	519	314
*RU3XB	*	232,323	395	273
*RU3DM	*	211,392	430	288
*RV3BQ	*	200,168	441	262
*RA3UAG	*	191,436	361	258
*RX3RZ	*	174,666	399	258
*UA3AKI	*	160,341	355	291
*RV3DAK	*	142,896	325	229
*UA3RAW	*	131,130	324	235
*RU4WE	*	114,600	287	200
*RU6YY	*	92,757	210	147
*RV3QX	*	62,238	164	138
*UA3DCW	*	59,594	201	166
*UA4CC	*	30,992	140	104
*UA1OMS	*	24,983	102	83
*RA1AFT	*	21,836	119	106
*UA1QV/P	*	19,448	100	88
*RW4CG	*	17,533	106	89
*RU3WR	*	17,458	109	86
*RX3MM	*	17,381	101	91
*UA4QK	*	11,704	80	77
*RN6FK	*	1,472	24	23
*RW4HM	*	644	17	14
*UA3UBT	*	640	16	16
***RA3AN**	**21**	**399,280**	**603**	**358**
***RU4SS**	**21**	**136,323**	**301**	**243**
*RW4FX	*	53,760	180	140
*RK6CM	*	31,734	150	129
*RW4LQ	*	1,242	24	23
***UA3DNR**	**14**	**957,528**	**1038**	**558**
***RL1M**	**14**	**360,513**	**585**	**369**
*RK4HD	*	285,012	452	351
*UA1ONG	*	271,600	512	350
*RA1OK	*	245,680	496	332
*UA3TU	*	90,666	284	219
*RA6MS	*	86,478	266	213
*UA3URD	*	81,792	270	213
*UA3XGM	*	63,180	201	126
***RN6AI**	**3.5**	**61,335**	**200**	**145**
*RZ3VA	*	24,849	112	99
*RA3ANL	*	21,576	107	87

KALININGRADSK

RN2FA	*	**375,232**	**547**	**328**
			(Op: RW2F)	
RV2FW	**3.5**	**584,330**	**693**	**355**

UKRAINE

EO6F	**A**	**3,519,140**	**2460**	**716**
			(Op: UXØFF)	
UYØZG	**A**	**1,390,536**	**1233**	**558**
EN1U	**A**	**988,982**	**1034**	**478**
			(Op: UX1UA)	
UX3HA	*	356,580	675	315
UR5E	*	242,616	387	264
			(Op: UR5EDX)	
US5IND	*	88,572	279	183
UT3EK	*	27,300	150	130
UR8RF	*	2,139	26	23
UU5AB	*	352	12	11
UXØI8	**21**	**436,175**	**655**	**365**
UT4IZL	*	134,406	359	218
			(Op: UYØIA)	
UW5Q	**14**	**2,621,360**	**1820**	**755**
UZ7U	**14**	**2,299,419**	**1681**	**717**
			(Op: UT3UA)	
UZ8M	*	1,203,882	1207	566
			(Op: US0MR)	
UY5ZZ	*	414,800	683	400
US2IR	**7**	**1,923,878**	**1101**	**557**
UT4EK	*	426,365	462	317
UX5I	**3.5**	**215,514**	**415**	**234**
			(Op: UT5IZ)	
***UW5U**	**A**	**1,773,321**	**1662**	**561**
			(Op: UY2UA)	
***UR5HAC**	**A**	**1,720,278**	**1598**	**574**
***UT2IO**	**A**	**1,390,293**	**1394**	**537**
*UR6QS	*	1,144,268	1149	482
*UT4XU	*	605,346	765	406
*UW7M	*	542,300	687	374
			(Op: UR3MP)	
*UY5TE	*	503,677	765	359
*EMØU	*	462,280	648	364
*UY5ZI	*	447,120	620	368
*UT8EU	*	289,296	472	294
*UR7EU	*	78,435	249	189
*UX1HW	*	19,158	98	93
*UZ2H	*	6,900	52	46
			(Op: UT5HA)	
*UU2JA	*	6,160	51	44
*UTØRM	*	4,320	42	40
*UT5UGO	*	20	5	4
***US7IGF**	**21**	**337,696**	**576**	**346**
*UY3AW	*	15,717	115	93
***UW8M**	**14**	**1,195,056**	**1258**	**579**
***EN1I**	**14**	**1,036,000**	**1062**	**560**
			(Op: US1ITU)	
*UX5EF	*	218,960	441	322
*UY5OQ	*	157,248	342	273
*UX7QD	*	123,008	322	248
*UY5WA	*	105,105	300	231
*UY5YA	*	95,472	266	216
***UT1FA**	**7**	**1,099,560**	**834**	**440**
***UY6IM**	**7**	**940,824**	**755**	**438**
***UW2F**	**7**	**657,111**	**670**	**377**
			(Op: UTØFT)	
*UR7EQ	*	626,448	624	372
*UW6N	*	431,802	548	322
			(Op: UR5NX)	
*US3QAA	*	338,720	490	292
*UT1WW	*	261,522	370	261
*UT3QT	*	227,360	338	245
*UT7ET	*	220,560	357	240
*UY2ZZ	*	111,786	251	186
***UR6IJ**	**3.5**	**26,334**	**117**	**99**
***UX5NO**	**1.8**	**121,149**	**294**	**189**
*US0QG	*	2,280	34	30

LATVIA

YL5W	**A**	**3,062,400**	**2203**	**704**
YL2KO	**A**	**2,787,480**	**2003**	**696**
***YL2GN**	**A**	**1,419,714**	**1394**	**549**
*YL2GTD	*	105,084	260	189
*YL2EC	*	90,706	261	209
***YL5M**	**14**	**318,357**	**907**	**351**
			(Op: YL2UZ)	
*YL2PP	*	88,360	236	235
***YL3AD**	**7**	**372,084**	**456**	**307**
***YL2CR**	**3.5**	**48,863**	**176**	**131**

ROMANIA

YO7BGA	**A**	**142,645**	**335**	**235**
YO3KYO	*	91,611	302	243
YO5KAI	**21**	**127,452**	**409**	**228**
			(Op: YO5TE)	
YP3A	**7**	**2,239,383**	**1270**	**583**
			(Op: YO9GZU)	
YO9WF	*	622,799	587	367
YR5A	**3.5**	**466,697**	**642**	**319**
			(Op: YO5OHO)	
YO2RR	**1.8**	**19,762**	**115**	**82**
***YO2NAA**	**A**	**1,317,370**	**1136**	**515**
***YO4AAC**	**A**	**266,252**	**376**	**257**
*YO2CMI	*	198,912	336	256
*YO3FRI	*	188,638	340	257
*YO8MI	*	88,230	226	173
***YO2AQB**	**28**	**15,132**	**128**	**97**
***YO6OBH**	**14**	**542,124**	**635**	**444**
*YR8A	*	96,811	250	210
*YO4BEX	*	20,060	127	118
*YO7ARY	*	5,830	54	53
***YO6EX**	**7**	**679,491**	**522**	**309**
*YO9HG	*	28,726	128	106
***YO2KJI**	**3.5**	**473,841**	**586**	**323**
			(Op: YO2DFA)	

YUGOSLAVIA

YT6A	**A**	**6,622,488**	**3030**	**893**
YT1AD	**A**	**5,410,515**	**2853**	**813**
			(Op: YU7NU)	
YZ9A	**A**	**4,832,936**	**2729**	**778**
			(Op: YU1NW)	
YT7Z	**21**	**607,982**	**783**	**426**
			(Op: YU7EU)	
YT1BB	**14**	**2,320,603**	**1713**	**703**
YT7DQ	**14**	**1,403,496**	**1258**	**579**
YZ7A	**7**	**1,441,833**	**1012**	**487**
			(Op: YU7KC)	
YT9M	*	965,679	832	429
YZ1AU	**3.5**	**563,552**	**668**	**352**
YU1KR	*	485,080	608	335
***YT1LT**	**A**	**1,426,128**	**1271**	**528**
***YU1WC**	**A**	**877,026**	**959**	**467**
***YZ1EW**	**A**	**742,182**	**784**	**431**
*YU7AM	*	604,219	782	413
*YU1KT	*	261,170	477	287
*YU1AU	*	99,699	287	199
*YT1AT	*	99,220	269	205
*YU1ZZ	*	13,398	86	77
***YT9X**	**21**	**674,928**	**848**	**436**
			(Op: YZ1KA)	
*YT1VM	*	187,630	350	290
*YU1IV	*	3,772	42	41
***YU7LS**	**14**	**770,175**	**845**	**489**
***4N1FG**	**7**	**1,211,826**	**905**	**473**
***YZ1V**	**7**	**1,120,878**	**931**	**459**
			(Op: YT1HA)	
*YT1XX	*	758,976	695	402
***YTØT**	**3.5**	**346,983**	**532**	**287**
			(Op: YU1YV)	
*YU7QL	*	125,832	303	196
***YU1RA**	**1.8**	**74,256**	**229**	**156**
***YU1EA**	**1.8**	**51,348**	**187**	**132**

MACEDONIA

***Z35G**	**A**	**121,370**	**298**	**229**

OCEANIA

FIJI

***3D2NC**	**A**	**2,924,598**	**1600**	**543**
			(Op: AC6DD)	

TIMOR-LESTE

4W3DX	**21**	**67,088**	**201**	**112**
			(Op: TF3MM)	
***4W3CW**	**A**	**926,550**	**1011**	**290**

THE PHILIPPINES

DU3NXE	**A**	**251,569**	**423**	**197**

SAIPAN

KHØP	**21**	**333,918**	**487**	**234**

GUAM

KG6DX	**21**	**1,932,832**	**1197**	**544**

HAWAII

KH6ND	**14**	**4,126,690**	**1901**	**730**
			(Op: KH6ND @KH7R)	

AUSTRALIA

VK8AV	**A**	**311,684**	**316**	**268**
VK6LW	**14**	**2,885,760**	**1519**	**640**
***VK3DBQ**	**A**	**22,680**	**89**	**81**
***VK1AI**	**A**	**20,276**	**86**	**74**
***VK4TT**	**28**	**64,310**	**187**	**118**

INDONESIA

***YBØECT**	**28**	**97,382**	**225**	**146**
***YC1ANA**	**21**	**238,620**	**332**	**246**
*YC1YIA	*	36,516	120	102
***YB2DGR**	**14**	**132,480**	**250**	**180**

NEW ZEALAND

***ZL/W3SE**	**A**	**662,448**	**635**	**296**
***ZL1AIH**	**A**	**576,702**	**502**	**322**

SOUTH AMERICA

ANTARTICA

DP1POL	**A**	**42,624**	**135**	**111**

URUGUAY

CX5BW	**21**	**4,004,397**	**1863**	**729

ARUBA

P41P	**A**	**12,051,994**	**3916**	**899**
			(Op: KØDQ/A92Q)	
P4ØL	**A**	**9,490,320**	**3254**	**840**
			(Op: W6LD)	

NETHERLANDS ANTILLES

PJ2W	**A**	**7,737,660**	**2896**	**801**
			(Op: WI9WI)	

BRAZIL

ZW5B	**28**	**4,090,515**	**1943**	**715**
			(Op: PY1NX)	
ZY5G	*	72	6	6
			(Op: PP5WG)	
PX2W	**21**	**4,616,150**	**2048**	**763**
			(Op: PY2YU)	
PX5A	7	259	7	7
			(Op: PP5UA)	
***PR2F**	**A**	**7,969,896**	**2905**	**792**
			(Op: PY2NDX)	
***PU7EEL**	**A**	**1,572,772**	**939**	**458**
***PY7IQ**	**A**	**1,331,820**	**970**	**441**
*PW2F	*	1,095,520	883	410
*PY1KX	*	413,922	441	298
*PY4FQ	*	343,140	424	258
*PP7ZZ	*	325,635	410	255
*PP7CW	*	196,504	279	203
*PR7HR	*	65,968	153	124
*ZW3J	*	55,428	154	124
*PY7GK	*	40,500	126	100
*PR7NJ	*	35,631	117	107
*PR7FN	*	2,673	33	33
***PY3KN**	**28**	**2,838**	**34**	**33**
*PU2PTO	*	1,080	20	20
***PY2NY**	**14**	**2,068,122**	**1217**	**574**
***PR7AR**	**7**	**136,656**	**169**	**144**
***PY7OJ**	**3.5**	**16,650**	**57**	**50**

FERNANDO DE NORONHA

PRØF	**A**	**12,802,125**	**3912**	**875**
			(Op: YU1RL)	

VENEZUELA

YW1D	**7**	**4,951,152**	**1331**	**628**
			(Op: YV1DIG)	
***YV7QP**	**A**	**114,675**	**198**	**165**
***YY5YMA**	**21**	**359,988**	**476**	**262**
*YV4AA	*	144,312	291	168
			(Op: YV4GLD)	
*YV5AAX	*	129,965	239	187

TRIBANDER/SINGLE ELEMENT

UNITED STATES

K2PLF	**A**	**2,722,896**	**1654**	**648**
KQ7M	**A**	**2,191,266**	**1816**	**651**
			(Op: N2WW)	
N6CW	**A**	**2,010,280**	**1377**	**580**
KZ5D	**A**	**1,972,500**	**1646**	**625**
W1MO	**A**	**1,956,636**	**1498**	**594**
N2GC	**A**	**1,952,190**	**1279**	**545**
N3UM	*	1,668,615	1308	559
KW5DX	*	1,417,647	1357	561
			(Op: K1LL)	
KA2MGE	*	1,327,149	1082	501
K4BAI	*	1,295,796	1311	498
K9WIE/Ø	*	1,268,798	1115	523
NJ2NJ	*	1,263,920	1061	488
			(Op: AA5B)	
WF3J	*	1,010,040	885	456
N6HC	**A**	**942,837**	**960**	**417**
WØGG	*	870,012	936	468
W5EKF	*	858,600	1013	424
K2SX	*	715,384	788	401
W7QN	**A**	**346,150**	**614**	**322**
K7VI	*	191,664	455	242
KS7T	*	119,192	285	188
N2CU	*	101,442	251	174
NO6X	*	34,832	151	112
NC6M	*	10,368	96	72
			(Op: W7SW)	
W6RKC	**21**	**36,375**	**140**	**125**
NT6K	**14**	**253,005**	**599**	**303**
KØCOP	**14**	**70,281**	**176**	**171**
WA3AAN	**14**	**57,600**	**203**	**160**
K1VW	**3.5**	**140,086**	**286**	**178**
***WD4AHZ**	**A**	**1,504,126**	**1325**	**533**
***WD5K**	**A**	**1,311,106**	**1195**	**538**
*NA4K	*	1,250,970	1244	483
***K3NK**	**A**	**1,084,713**	**1013**	**471**
*KG4FPJ	*	984,753	969	441
			(Op: N4GI)	
***KV8Q**	**A**	**845,614**	**933**	**418**
***WN6K**	**A**	**822,339**	**989**	**399**
*KW4CW	*	815,654	816	406
			(Op: W4SAA)	
*W9WI	*	700,948	1018	401
*K8IR	*	532,532	679	364
***KI7Y**	**A**	**429,072**	**638**	**336**
*WB8TLI	*	412,446	506	318
***N3KCJ**	**A**	**381,440**	**484**	**298**
*K4FK	*	365,050	414	350
			(Op: K9AW)	
*K2YWE	*	293,440	469	280
*W8PN	*	213,180	441	255
***WR1TE**	**A**	**197,175**	**375**	**239**
			(Op: W1JQ)	
*K4AMC	*	173,116	400	226
*NQ5K	*	161,238	445	231
			(Op: W5ASP)	
*KT5E	*	157,542	419	242
***WØRT**	**A**	**128,700**	**244**	**198**
*W4TYU	*	106,860	316	195
*K6OWL	*	80,828	260	167
*N6GL	*	61,408	228	152
*K4SAC	*	51,375	210	137
*W3CB	*	51,051	182	143
*N5PU	*	44,200	178	130
*K4BEV	*	39,627	174	119
*W7SW	*	38,052	151	126
*K5GM	*	34,428	133	114
*AE9B	*	30,876	190	124
*NA8M	*	22,764	92	84
*NK6A	*	10,658	94	73
*AB4RL	*	9,164	64	58
*K1EP	*	6,808	50	46
*W3FQE	*	3,774	40	34
*N4TW	*	396	18	18
***K5WW**	**28**	**1,155**	**21**	**21**
***K8IA**	**14**	**905,465**	**875**	**505**
***W8IQ**	**14**	**15,876**	**86**	**81**
***AK6R**	**7**	**135,707**	**286**	**169**

DX

CT9A	**A**	**11,257,028**	**3624**	**851**
			(Op: OH6RX)	
J7A	**A**	**8,367,519**	**3325**	**859**
			(Op: K5KG/J75KG)	
CT3KN	*	5,452,378	2021	701
EA1DX	**A**	**3,879,704**	**2318**	**796**
			(Op: EA5FV)	
RZ3AZ	**A**	**3,668,311**	**2335**	**779**
RA9SG	**A**	**2,932,772**	**1469**	**578**
HA3LI	**A**	**2,370,690**	**1654**	**639**
JA7DLE	**A**	**2,227,407**	**1335**	**597**
EA4NP	*	2,127,237	1562	609
DL3YBM	**A**	**1,889,925**	**1539**	**565**
OK2ZC	**A**	**1,440,094**	**1281**	**542**
LY2QX	**A**	**1,199,520**	**1083**	**510**
GJ2A	**A**	**1,146,600**	**1124**	**504**
			(Op: K2WR)	
OL7D	*	1,125,496	1128	523
			(Op: OK1FHI)	
GM4SID	**A**	**1,114,316**	**1170**	**476**
EN1U	**A**	**988,982**	**1034**	**478**
			(Op: UX1UA)	
DH1NFL	*	792,610	873	455
OK2ABU	*	748,034	799	449
UN5J	**A**	**612,909**	**651**	**369**
PAØJNH	**A**	**495,060**	**629**	**370**
EI4DW	**A**	**478,828**	**631**	**349**
JA1HP	*	397,200	494	331
JA1QOW	*	319,056	414	289
F5YJ	**A**	**300,390**	**488**	**285**
OH2VZ	**A**	**164,750**	**351**	**250**
7M4GTU	*	96,714	216	162
YO3KYO	**A**	**91,611**	**302**	**243**
VA3EC	**A**	**82,593**	**196**	**161**
UA1AKE	*	23,004	104	71
DH1TW	*	21,004	108	89
KG6DX	**21**	**1,932,832**	**1197**	**544**
DK2GZ	**21**	**707,135**	**735**	**473**
HSØZDZ	**21**	**355,266**	**523**	**306**
IKØYVV	**14**	**2,229,390**	**1581**	**690**
JA9CWJ	**14**	**439,005**	**481**	**339**
OE5CWL	**7**	**1,482,329**	**1095**	**491**
***LU5FF**	**A**	**3,445,488**	**1826**	**639**
***TK/S52A**	**A**	**2,976,190**	**1860**	**697**
			(Op: S59AA)	
***3D2NC**	**A**	**2,924,598**	**1600**	**543**
			(Op: AC6DD)	
***AM7RM**	**A**	**2,739,910**	**2048**	**622**
***IR2Y**	**A**	**2,417,500**	**1714**	**625**
***T97M**	**A**	**2,412,112**	**1749**	**656**
***LZ3YY**	**A**	**1,951,056**	**1682**	**612**
***VE3ANX**	**A**	**1,907,223**	**1278**	**509**
***PU7EEL**	**A**	**1,572,772**	**939**	**458**
***GØMTN**	**A**	**1,424,294**	**1501**	**514**
***OK1HX**	**A**	**1,398,123**	**1263**	**531**
*VE3KP	*	1,394,172	1007	468
***7M1MCT**	**A**	**1,391,280**	**956**	**496**
*AM4DRV	*	1,389,750	1389	545
***LA3BO**	**A**	**1,381,072**	**1407**	**532**
***ES5RY**	**A**	**1,346,982**	**1239**	**546**
*PY7IQ	*	1,331,820	970	441
***YO2NAA**	**A**	**1,317,370**	**1136**	**515**
*JI1RXQ	*	1,094,703	869	447
***OM6RM**	**A**	**1,089,726**	**1173**	**474**
*JH2NWP	*	1,037,357	788	439
*OK2QX	*	999,110	1024	490
***YU1WC**	**A**	**877,026**	**959**	**467**
***SN5J**	**A**	**626,940**	**716**	**405**
			(Op: SP5JXK)	
*VE3CR	*	550,620	607	345
*JA2KVB	*	538,752	606	366
***PB6W**	**A**	**503,956**	**767**	**361**
			(Op: PA3CWL)	
*JF2QNM	*	482,480	581	326
*PY1KX	*	413,922	441	298
***CT1AOZ**	**A**	**393,056**	**530**	**346**
*OM4TX	*	357,000	509	340
*M8C	*	339,301	483	311
			(Op: G4DBL)	
*G3YEC	*	297,822	480	294
***RA6HR**	**A**	**280,402**	**519**	**314**
*CK3WO	*	274,340	372	220
***VE7ASK**	**A**	**252,894**	**399**	**226**
*JA1XRH	*	204,960	318	210
***OH5YU**	**A**	**191,970**	**427**	**270**
*JS6GIM	*	183,189	296	227
***F5RAB**	**A**	**171,196**	**408**	**254**
*VA3ATT	*	169,538	303	206
***VO1TA**	**A**	**167,972**	**286**	**196**
*JA2VZL	*	163,548	260	198
*IN3FHE	*	153,008	341	262
***SM4F**	**A**	**126,672**	**257**	**203**
			(Op: SM4DHF)	
***VE4YU**	**A**	**107,334**	**237**	**178**
*PA5EA	*	94,276	250	196
*G4GOY	*	72,975	239	175
*VA3UA	*	70,200	199	150
***RAØAM**	**A**	**69,412**	**171**	**148**
*JE1TSD	*	34,496	116	98
*JA2KCY	*	24,444	116	84
*JA3DAY	*	23,751	99	91
*JAØXZD	*	22,770	97	90
*LZ4BU	*	16,910	99	95
***DF5AU**	**A**	**6,250**	**62**	**50**
***VK4TT**	**28**	**64,310**	**187**	**118**
***PAØJED**	**21**	**74,555**	**217**	**185**
***VE3RCN**	**21**	**42,189**	**154**	**123**
***UN8FM**	**21**	**3,104**	**35**	**32**
***VE1OP**	**14**	**1,459,872**	**1073**	**548**
***JI3BFC**	**14**	**228,760**	**348**	**266**
***OZ4RT**	**14**	**200,640**	**330**	**330**
***GI4KSH**	**14**	**47,571**	**177**	**157**
*JA3LKE	*	10,980	66	61
***UW2F**	**7**	**657,111**	**670**	**377**
			(Op: UTØFT)	
***IR2V**	**7**	**537,716**	**550**	**358**
			(Op: I2WIJ)	
***PAØMIR**	**3.5**	**107,016**	**257**	**182**
***S53P**	**3.5**	**87,780**	**254**	**165**
			(Op: S51NZ)	
***VE3XAX**	**3.5**	**8,736**	**52**	**42**

ROOKIE

SP5HNK	**A**	**683,700**	**878**	**430**
AA3TL	**A**	**7,686**	**68**	**61**
***CT1ILT**	**A**	**3,697,200**	**2217**	**720**
***UR5HAC**	**A**	**1,720,278**	**1598**	**574**
***YT1LT**	**A**	**1,426,128**	**1271**	**528**
***LY2XW**	**A**	**893,748**	**1139**	**426**
***AI3M**	**A**	**397,065**	**640**	**309**
***SQ9MZ**	**A**	**297,040**	**483**	**316**
***F6ABI**	**A**	**83,569**	**236**	**193**
***W6SJ**	**A**	**65,664**	**241**	**152**
***DJ9AO**	**A**	**62,720**	**200**	**160**
***KB9YOZ**	**A**	**44,671**	**174**	**131**
***VA3HUN**	**A**	**33,541**	**127**	**99**
***W2RDS**	**A**	**19,040**	**94**	**80**
***N7EIE**	**A**	**10,640**	**100**	**76**
*W7AJK	*	7,700	70	55
***YY5YMA**	**21**	**359,988**	**476**	**262**
***UA9JRL**	**21**	**22,428**	**101**	**84**
***ON5ZO**	**7**	**75,543**	**214**	**149**
***ES1TM**	**3.5**	**87,880**	**251**	**169**

BAND LIMITED

RW6CF	**7**	**328,500**	**414**	**292**
***JR5EHB**	**A**	**73,950**	**205**	**145**
***7K2PBB**	**28**	**882**	**22**	**21**
***MXØEEE/P**	**14**	**58,056**	**264**	**177**
			(Op: GØVQR)	

SINGLE OPERATOR ASSISTED

UNITED STATES

WM4RM	**A**	**3,309,966**	**1716**	**657**
			(Op: W4RM)	
N8BJQ	**A**	**2,749,680**	**1686**	**684**
AB2E	**A**	**2,735,810**	**1657**	**646**
W5GN	**A**	**1,902,234**	**1461**	**606**
K3KO	*	1,844,594	1145	566
KC1F	**A**	**1,389,767**	**999**	**493**
N4WW	*	1,144,829	924	469
K3WA	**A**	**1,021,515**	**942**	**451**
W3FV	*	960,630	913	410
N5JR	*	645,280	682	436
K9UQN	**A**	**558,484**	**725**	**382**
W3HVQ	*	480,080	529	340
W6OAT	**A**	**479,504**	**602**	**368**
WØTT	**A**	**333,982**	**570**	**323**
N2BJ	*	220,050	348	270
W3IQ	*	217,088	331	256
KG6PSI	*	134,375	292	215
			(Op: K6III)	
W4HJ	*	132,308	231	194
W3KLG	*	131,626	243	193
			(Op: K3ND)	
NM6E	*	41,448	197	132
NI6T	*	29,260	126	95
***WN9O**	**A**	**1,653,752**	**1306**	**604**
			(Op: W9IU)	
***W1EBI**	**A**	**820,919**	**807**	**407**
*W1RM	*	547,690	491	383
***K4FPF**	**A**	**402,792**	**526**	**312**
***AD6WL**	**A**	**359,450**	**559**	**325**
*K2RD	*	272,340	544	267
*WO1N	*	248,254	412	278
*NG1J	*	165,130	255	245
***W2GG**	**A**	**151,424**	**336**	**224**
*KE1F	*	117,992	253	196
*KB3MM	*	94,828	189	151
***W7HS**	**A**	**60,450**	**176**	**150**
***AF8C**	**A**	**52,052**	**181**	**143**
*K8AJS	*	47,875	142	125
*K7TR	*	6,496	61	56
*K3FH	*	1,450	26	25
***WB2BXO**	**21**	**25,647**	**112**	**103**
***N4XMX**	**7**	**4,515**	**36**	**35**

DX

TO5AA	**A**	**10,318,875**	**3630**	**875**
			(Op: RW3QC)	
UA9AM	**A**	**6,303,075**	**2393**	**775**
OD5/OK1MU	**A**	**6,262,286**	**2703**	**739**
JY9QJ	**A**	**5,604,885**	**2296**	**715**
IR9T	**A**	**5,099,772**	**2549**	**804**
			(Op: IT9GSF)	
OHØB	**A**	**4,790,570**	**3049**	**815**
			(Op: OH2JTE)	
HG6N	**A**	**4,642,164**	**2659**	**811**
			(Op: HA3OV)	
DL6FBL	**A**	**4,560,192**	**2281**	**819**
RM3C	**A**	**4,143,304**	**2436**	**788**
			(Op: RA3CW)	
YLØA	**A**	**3,363,750**	**2452**	**750**
			(Op: YL2KA)	
DK3GI	*	2,929,586	1658	671
RU6MM	*	2,282,199	1906	613
OK1FDY	**A**	**2,000,368**	**1474**	**592**
OH6NIO	**A**	**1,960,000**	**1623**	**625**
LY8X	**A**	**1,766,928**	**1438**	**562**
			(Op: LY2BIL)	
DFØFS	*	1,557,330	1401	555
			(Op: DL1EKC)	
I1NVU	**A**	**828,610**	**999**	**470**
HAØHW	*	805,714	963	466
OK2ZW	*	762,135	791	447
UAØAGI	**A**	**762,120**	**681**	**365**
7M4CDX	**A**	**621,250**	**557**	**355**
G4WFQ	**A**	**564,750**	**647**	**375**
9A8A	**A**	**440,438**	**610**	**349**
SM6WQB	**A**	**439,766**	**617**	**346**
IK3QAR	*	273,735	505	315
VA6XDX	**A**	**198,720**	**305**	**207**
			(Op: VE6LB)	
UX1IL	**A**	**166,581**	**293**	**223**
DL6KVA	*	144,708	268	186
OK2ZJ	*	137,776	299	218
OH2CI	*	116,842	381	226
OE1TKW	**A**	**58,176**	**171**	**144**
UU2JQ	*	6,345	50	47
EO1I	**28**	**143,664**	**390**	**246**
			(Op: UT1IA)	
OH6KTD	*	55	5	5
DL2OBF	**21**	**1,447,810**	**1119**	**602**
HA3NU	**21**	**1,052,835**	**989**	**555**
DH7KU	**21**	**434,112**	**626**	**399**
OH6NJ	**21**	**215,912**	**494**	**274**
II1H	**14**	**2,690,080**	**1788**	**731**
LZ2BE	**14**	**1,369,123**	**1287**	**617**
S51U	**14**	**89,870**	**261**	**190**
DL4CF	**14**	**39,516**	**163**	**148**
DJ5MW	**7**	**1,810,536**	**1159**	**546**
DL6RAI	*	1,582,605	1025	513
EA5FID	**7**	**958,900**	**664**	**430**
OH3BU	**7**	**514,026**	**572**	**342**
OM7PY	**7**	**322,894**	**391**	**286**

The station of VC1R (AE6Y at VE1JF).

Z32AF	**3.5**	**476,682**	**614**	**318**
***S52ZW**	**A**	**2,599,230**	**1719**	**690**
***9A7P**	**A**	**1,283,427**	**1202**	**531**
***DJ9MH**	**A**	**1,191,204**	**1025**	**522**
***OM7JG**	**A**	**1,065,627**	**936**	**501**
***JR4ISF/3**	**A**	**943,940**	**760**	**433**
***PR7AB**	**A**	**743,725**	**652**	**355**
***LN3R**	**A**	**590,679**	**827**	**393**
			(Op: LA5LJA)	
*DL3PS	*	493,768	578	362
***CJ3NR**	**A**	**434,812**	**494**	**293**
			(Op: VA3NR)	
*DJ9RR	*	397,440	591	345
***SM6BSK**	**A**	**310,068**	**470**	**324**
*DM3PKK	*	163,680	328	240
*JA3PYC	*	154,770	275	201
*JF2SKV	*	137,922	290	181
*7N2DAB	*	108,480	223	160
*DJ9NMH	*	92,736	246	168
*JG3NKP/1	*	87,341	197	167
*VE3OJ	*	55,460	142	118
***AM1FBJ**	**A**	**50,224**	**179**	**146**
***OK1CJN**	**A**	**45,353**	**148**	**133**
***TF3VS**	**A**	**44,982**	**162**	**147**
*9A5K	*	18,837	120	91
*DL4RCK	*	10,560	68	64
*OK1VVW	*	6,944	62	62
*JJ1BDX/3	*	4,305	42	35
***EA1AK/AM7**	**21**	**231,770**	**404**	**301**
***RUØBB**	**21**	**122,409**	**245**	**201**
***JA3YPL**	**14**	**431,200**	**491**	**352**
***OK1KT**	**3.5**	**78,352**	**226**	**166**

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

NO5W	**5,996,820**	**2956**	**890**
NZ1U	**4,634,914**	**2232**	**782**
K9ES	**2,572,885**	**1604**	**665**
WO8CC	**2,410,320**	**1533**	**664**
K4NNN	2,359,110	1534	598
N3AD	**2,007,135**	**1354**	**611**
KC9ARR	**1,180,920**	**1151**	**520**
NF1D	558,546	607	381
W4ZE	518,654	642	346
NØKE	**371,127**	**556**	**323**
KN6Y	**206,550**	**441**	**255**
N7IH	**118,152**	**296**	**216**
W6YRA	83,157	241	159

NORTH AMERICA

ZF1A	**13,636,728**	**4021**	**1044**
CK7SV	**5,429,956**	**2272**	**742**
CK7GL	5,086,620	2103	734
VE6AO	**885,532**	**847**	**428**

ASIA

A61AJ	**13,754,804**	**4366**	**926**
YM2ZF	**10,783,872**	**3548**	**851**
RW9C	**5,389,332**	**2125**	**716**
JA8RWU	**3,312,696**	**1753**	**664**
RK9CXM	1,630,408	1087	488

EUROPE

OM7M	**8,154,091**	**3456**	**979**
AN6IB	**7,515,452**	**3502**	**973**
EN7Z	**7,493,886**	**3730**	**914**
HG1S	**7,427,619**	**3174**	**963**
OL3A	**6,001,376**	**2839**	**892**
OE2S	**5,689,620**	**2727**	**876**
S5ØU	**5,665,092**	**2683**	**876**
OE8CIQ	5,280,664	2805	796
OM5M	5,129,136	2534	837
Z37M	**3,980,250**	**2749**	**750**
OL5Q	3,871,245	2258	735
TM9C	**3,819,600**	**2295**	**720**
UT7L	3,581,865	2250	747
DAØSAX	**3,547,236**	**2192**	**726**
RY4J	**3,337,217**	**2267**	**767**
UT9F	3,117,268	2295	698
HG8N	2,799,007	2042	673
OM4A	2,737,680	1849	680
DLØDX	2,312,982	1694	633
SI9AM	**2,220,150**	**2012**	**615**
F8BPN	2,128,130	1761	590
DFØLI	1,664,640	1358	578
EM4IZA	1,377,272	1407	533
G5X	**1,099,672**	**1189**	**511**
OL2U	1,031,724	1125	492
DLØMZ	799,172	914	443
LY3VM	**783,580**	**907**	**406**
USØQ	442,365	656	385
GX3SAD	322,509	615	337
OL5T	314,880	460	320
LN1K	**302,418**	**568**	**318**
UR4IYZ	183,744	400	261
RK1NWA	168,881	455	281
UU5A	49,248	198	162
LN2AB	31,571	157	131
LZ1KSC	**31,496**	**152**	**127**

SOUTH AMERICA

PT5A	**14,158,420**	**3976**	**1060**

OCEANIA

ZM1A	**6,936,448**	**2606**	**752**

MULTI-OPERATOR TWO TRANSMITTER

UNITED STATES

KM4M	**12,395,116**	**4393**	**1019**
KX7M	**5,750,379**	**2928**	**801**
WX5S	4,649,494	2526	757
NG3U	**2,880,100**	**1777**	**694**

NORTH AMERICA

C6AKU	**2,886,336**	**1771**	**576**
CJ7DX	**1,819,000**	**1217**	**500**
CO8LY	**1,179,468**	**1122**	**402**
AL1G	**434,907**	**507**	**253**

ASIA

RT9W	**12,006,568**	**3927**	**872**

EUROPE

R3ØØSP	**12,793,452**	**5964**	**1054**
RO4M/6	8,585,466	4412	933
OL7W	**7,310,688**	**3532**	**903**
UU7J	**6,670,932**	**3697**	**881**
PI4COM	**6,279,120**	**3113**	**855**
OT3A	**4,178,195**	**2490**	**721**
SJ5AA	**3,169,952**	**2398**	**736**
SO6Y	**2,605,760**	**1825**	**680**
9AØR	**1,718,556**	**1293**	**574**
4N1N	**748,665**	**778**	**381**

OCEANIA

ZL6QH	**12,029,472**	**3600**	**884**
4D1Q	**1,858,890**	**1316**	**438**

SOUTH AMERICA

HC8N	**30,928,268**	**7389**	**1189**

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

NY4A	**14,537,984**	**4913**	**1042**
NO4I	11,602,944	4822	1024
NN5J	**8,280,338**	**3951**	**946**

ASIA

JJ1ZXE	**478,626**	**556**	**331**
JA1YPA	211,762	325	226

EUROPE

LZ9W	**13,294,575**	**5752**	**1035**
LY7A	**8,961,169**	**4707**	**919**
YL7C	**4,362,264**	**2878**	**774**
OZØXX	**4,314,870**	**2624**	**761**
OH2K	**1,959,375**	**1935**	**625**
OK7K	**1,338,970**	**1174**	**514**

SOUTH AMERICA

ZX3S	**3,948,860**	**1927**	**694**

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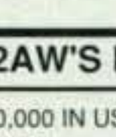

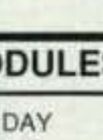

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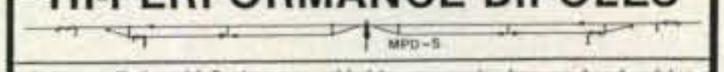

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